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Subscriptions should be sent to the Superintendent of Documents United States Government Printing Office, Washington 25, D. C.

Yearly subscription, \$5.25 foreign subscription, \$9.00

Single number 40 cents

Exchange of publications may be extended to medical and scientific organizations, societies, and journals. Communication on this subject should be addressed to the Editor UNITED STATES ARMY FORMS MEDICAL JOURNAL, PUSOMEX Annex, Department of the Navy Washington 25, D. C.

#### REPRINTS

The Superintendent of Documents will furnish on request, prices for reprint of 100 or more copies of articles contained in the UNITED STATES ARMY FORMS MEDICAL JOURNAL. Orders for reprints must be placed within 2 months after date of publication.

For prompt attention, requests must be addressed as follows: Superintendent of Documents, Attention: Procurement Section, Government Printing Office Washington 25, D. C.

#### THE JOURNAL IS INDEXED IN THE FOLLOWING PUBLICATIONS

*Current List of Medical Literature*

(Army Medical Library) Monthly listing of journal contents subject and author index monthly cumulative index annually

*Quarterly Cumulative Index Medicus*

(American Medical Association) Author and subject.

# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
Agency, Department of Defense*



WAYNE G. BRANDSTADT, Colonel, MC, U S A, Editor-in-Chief  
ROBERT J. BEXFORD, Colonel, U S A F (MC), Associate Editor  
WILLIAM R. WHITEFORD, Captain, MC U S N, Associate Editor

THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY  
THE DIRECTOR OF THE BUREAU OF THE BUDGET OCT 19 1949

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON 1951

For sale by the Superintendent of Documents, U. S. Government Printing Office  
Washington 25 D. C.

# Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

The Chairman of the Armed Forces Medical Policy Council and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy and Air Force to submit manuscripts for publication in this JOURNAL.

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LAMONT PUGH

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OFFICE OF THE SECRETARY OF DEFENSE  
ARMED FORCES MEDICAL POLICY COUNCIL  
WASHINGTON 25, D.C.

MEMO: Personnel of the Medical Services of the United States Armed Forces

Completion of an around-the-world survey of Army Navy and Air Force medical and research installations with Dr C W Mayo provided us with conclusive evidence of the unity of effort and the interservice coordination of the Medical Services in all theaters. The great value of specialized research at overseas installations on problems applicable to military medicine was clearly evident. The use of scientific attaches as in Great Britain and Sweden, and such installations as the Naval Medical Research Unit No 3 in Cairo are extremely worthwhile.

While visiting in Korea and Japan during which time Dr Leonard Scheele Surgeon General, U S Public Health Service was a member of the group, we found that the medical and surgical program of the three medical services and the evacuation chain had been developed so well that even the high standards of medical care of World War II have been excelled. The traditional heroism of company aid men in bringing out the wounded has contributed materially to this fine record of medical care as in the past. The splendid work of the battalion surgeons and the physicians in the mobile army surgical hospitals has proved the efficacy and wisdom of the postwar graduate training program.

As in the later phases of World War II the interval of time before a casualty receives definitive care has been markedly reduced by air evacuation. In addition, front line evacuation by helicopter is now an effective part of the chain of evacuation. It is limited to situations where there is clear air superiority. Air evacuation can now be made to the zone of the interior from any military installation in the world. The U S S. Repose and U S S. Haven have provided splendid floating hospitals and have been most helpful in the care of many casualties. The use of civilian and service consultants is both popular and worthwhile.

We were favorably impressed by the fact that military commanders in the field, from General Ridgway on down to the company commanders, expressed intense interest and pride in the effectiveness of the medical care being provided their men. The medical aid of our Allies in the United Nations is also excellent.

Although not widely appreciated, the success of the preventive medicine program is shown by the low incidence of disease in U N forces in Korea and in other overseas areas where many serious diseases are endemic and often epidemic. But for this program, diseases among U N personnel could well have caused more casualties than combat. Lieutenant Colonel L. C. Kossmuth, USAF (MC) accompanied us in the Middle East, where there are numerous epidemiologic problems.

From now on increased emphasis will be placed on the development of lightweight airborne hospital equipment improved surgical instruments standardization of the best items of improvised field equipment, research on the treatment of arterial wounds increased use of field research teams improvement and simplification of medical records, and the publication of a text on war wounds.

W Randolph Lovelace II

W Randolph Lovelace II, M. D.  
Chairman

# Blood Vessel Bank<sup>(1)</sup>

Francis N Cooke *Lieutenant Colonel, MC, U S A.*

Dwight M. Kuhns *Colonel, MC, U S A.*

John T Elston, *Major MC, U S A.*

Slater M Dozier, *Major MC, U S A.*

Matthew H Fusillo

**A**N ARTERIAL graft bank was established at this hospital in August 1949 following the principles of blood vessel preservation as outlined by Gross et al (2). The bank was initially used for animal experimentation. Later human blood vessels were banked at frequent intervals. The purpose of the bank was to have available homologous grafts which could be used to bridge aortic defects resulting from the removal of unusually long constricted segments (2,3). The large number of vascular injuries resulting from the Korean war in which large arterial defects made impossible the establishment of normal or near normal blood flow stimulated us to use preserved homologous grafts in some cases. The use of blood vessel banks has been found practical for civilian institutions (4). A plan of operation which has proved successful in this institution is presented. The information on which this operational procedure is based has been compiled from many sources (2,4-12).

(1) Walter Reed Army Hospital, Washington, D. C.

(2) Gross R. E.; Bill A. H. Jr., and Pirce E. C. II. Methods of preservation and transplantation of arterial grafts. *Gynec & Obst.* 88: 689 June 1949

(3) DeWitt E. Jr., Jr.; Cook F. N.; Paul J. S.; and Orblison, J. A.: Constriction of aorta at level of diaphragm treated successfully with preserved human blood vessel graft. *J Thorac Surg.* 21: 506-512, May 5, 1951

(4) Kester E. B. C.; Andrews W. DeW. Gilman, F.; Humphreys, G. H., II; Lord, J. W., Jr.; Murphy W. B. and Tenckhoff, A. S. W.: Blood vessel bank. *J. A. M. A.* 145: 889-893 Mar 24 1951

(5) Gross R. E.; Harwitz, E. S., Bill A. H., Jr.; and Pirce E. C. II: Preliminary observations on use of human arterial grafts in treatment of certain cardiovascular defects. *New England J Med.* 239: 578-579 Oct. 14 1948.

(6) Carrel A.: Heterotransplantation of blood vessel preserved in cold storage. *J Exper Med.* 9: 726, 1907

(7) Pirce E. C. II; Gross R. E. Bill A. H. Jr. Merrill K., Jr.: The culture value of blood vessels stored by refrigeration. *Ann. Surg.* 126: 333 Mar. 1949

(8) Deteling R. A. Jr., Coleman C. C. Jr.; and Parsley M. Preliminary report on experimental studies of frozen homologous aortic grafts. *New York Med.* 6: 19-20 July 5 1950.

(9) Gross R. E., and Pirce E. C. II. Personal communication to Major J. T. Elston.

(10) Parker R. C. *Method of Tissue Culture* 2d edition, Paul B. Hoeber, Inc., New York, N. Y. 1950

## PROCUREMENT OF MATERIAL FOR GRAFTS

The tissue used for grafts consists of segments of aorta, carotid, subclavian, and iliac arteries. These vessels are removed from the bodies of young persons within 4 hours after death. Death must have been unassociated with malignancy, leukemia, infectious diseases (viral, rickettsial, bacterial, spirochetal, or mycotic) or degenerative diseases such as periarteritis nodosa, arteriosclerosis, or disseminated lupus erythematosus. The major source of vessels is from cases of traumatic death.

The vessels are obtained in the operating room using strict aseptic technique as soon as permission for autopsy has been received. The usual Y-shaped autopsy incision is employed and the vessels are removed by approaching them laterally and posteriorly. The method is that employed in the first portion of the R. Kitansky block technique for removing organs at autopsy. This procedure does not distort the organs or in any way interfere with the work of the pathologist who later performs the autopsy. Prior to removing the vessels, blood is removed, the heart for blood culture and serologic tests for syphilis if the latter has not been recently accomplished. The vessels are cut into segments about 3 inches in length and extraneous tissue such as fat is removed from them. In the cases thus far encountered, longer segments have not been needed. If longer grafts were contemplated, they could easily be taken but taller storage bottles than those now used would be necessary.

The vessel segments are stored in 250-ml. bottles of the type used for blood storage (fig. 1). The bottles are filled to the 200-ml. mark with preservative fluid, the composition and preparation of which will be described below. The bottles are closed with a rubber stopper and a separately wrapped sterile rubber stopper accompanies each bottle. The surgeon, after cutting the vessel to the desired length, places a silk suture in one end of the vessel and sews the other end of the suture to the bottom of the second rubber stopper allowing about 3 inches of thread between the vessel and the stopper (fig. 2). The stopper is removed from the storage bottle and the vessel segment is lowered into the bottle. When the rubber stopper is in place the vessel segment will be completely suspended with all portions bathed by fluid (fig. 3). This method also prevents damage to the vessel from bending. Before leaving the operating room, all bottles are labeled as to autopsy number, date of acquisition, and length of time after death. The label also has space for results of tissue culture, bacteriologic culture, antibiotic assay and other chemical studies or comments.

(11) Cameron, G. Tissue Culture Techniques, 2d edition. Academic Press, Inc., New York, N. Y. 1950.

(12) Cameron, L.: Personal communication.



Figure 1 Vessel storage bottle. Figure 2. Vessel segment attached to stopper. Figure 3 Storage bottle containing arterial segment.

### STORAGE AND ISSUE OF VESSELS FOR GRAFTS

As soon as the bottles are labeled in the operating room they are carried to the blood vessel bank. There each bottle is given an acquisition number and all of the data on the label is recorded. The bottles are then placed in a thermostatically controlled refrigerator of the blood-bank type. The temperature in this refrigerator is maintained at 4 C. A mechanical recording device which is a part of the refrigerator maintains a graphic record of the temperature at all times. Bacterial cultures for anaerobic and aerobic bacteria employing penicillinase are conducted at the time the vessels are received and at 7-day intervals thereafter. All cultures are observed for 72 hours. Careful surveillance for mycotic contaminants should be maintained at all times (9). The fluid for culture is easily obtained by inserting a spinal needle through the rubber stopper after cleansing the stopper thoroughly and removing with a sterile sponge any toxic material used in the

cleansing process. Antibiotic assay is performed at the time of bacterial culture beginning with the seventh day of storage. The color of the indicator in the preservative fluid is observed daily and the pH is adjusted if indicated. If the fluid is too alkaline, filtered CO<sub>2</sub> will adjust it. If it is too acid, a few drops of buffer solution (described below) will correct this. The use of a rubber stopper prevents the escape of CO<sub>2</sub> from the solution and obviates a great deal of the trouble encountered with the use of cotton plugs. Tissue culture is performed on tissue from each donor beginning with the receipt of the material and continuing at 7-day intervals thereafter for the period of storage. One segment of the vessel is used for this purpose only. Because this procedure requires removal of the vessel from the container and increases the danger of trauma to or bacterial contamination of the specimen, this portion of vessel is never used for grafting. Since all segments of vessel in a given case come from the same person and are stored in the same fluid, the results of culture on this specimen are considered indicative of the state of the remainder of the vessel segments. Tissue culture is also performed on the portion of the vessel segment removed with the attached suture when it is used in graft. At present the results of tissue culture insofar as the success of the grafting is concerned has not been correlated, but future evaluation of this data may aid in clarifying this point. All preserved vessels are discarded after 28 days of storage.

Because practically all vessel grafting procedures are elective, notification of the bank relative to the procedure should take place 72 hours in advance of the operation when possible. The surgeon should select the bottles which he wishes sent to the operating room so that bacterial cultures may be begun on these specimens. On request from the operating room, near the time of prospective use of the graft, the desired specimens are issued. These are placed in refrigerator at 4 C. in the operating room until needed. All unused vessel segments are returned to the blood vessel bank as soon as it is determined that they will not be required. Complete records are kept on each segment used and returned unused vessel segments are subjected to the same procedures that are outlined above for newly acquired vessels.

#### PREPARATION OF STORAGE MEDIA

The preserving fluid consists of a balanced salt solution (4) to which streptomycin and penicillin plus 10 percent human plasma are added. One liter of stock balanced salt solution is prepared according to the following formula:

Sodium chloride	80.0 gm.
Potassium chloride	4.0 gm.
Magnesium sulfate	0.8 gm.
Magnesium chloride	0.8 gm.
Calcium chloride	1.84 gm.
Dibasic anhydrous sodium phosphate	0.6 gm.

Monobasic potassium phosphate	0.6 gm.
Dextrose	10.0 gm.
Phenol red (0.4% solution)	50.0 ml
Triply distilled water q. s. ad	1,000.0 ml

This stock solution may be stored at room temperature with the addition of 1 ml. of chloroform.

A buffer solution is then prepared according to the following formula:

Sodium bicarbonate	1.4 gm.
Triply distilled water q. s. ad	100.0 ml

100 ml. of stock solution is then diluted to 1,000 ml. and sterilized by autoclaving for 15 minutes at 15 pounds pressure. The buffer solution is sterilized by Seltz filtration. The pH of the salt solution is then adjusted to pH 7.6 by adding buffer solution and titrating with a Beckman pH meter. One hundred milliliters of reconstituted irradiated human plasma is then added. Human serum may be used in place of the latter. Lastly, 50 units of penicillin and 50 micrograms of streptomycin per ml. of preservative solution are added aseptically. Equal portions of the solution are then introduced aseptically into 5 cleaned and sterilized 250-cc. blood-bank bottles. These bottles are prepared by removing the rubber stoppers, discarding the Alsever's solution which they contain and washing repeatedly in distilled water. The bottles are then closed with rubber plugs; the rubber stoppers are wrapped separately and both the bottles and stoppers are autoclaved at 15 lb. for 15 minutes. After filling with the complete preservative fluid, the bottles are stored in the refrigerator until needed for vessel storage.

## TISSUE CULTURE

### *A. Preparation of material for tissue culture*

1. Chicken embryo extract is prepared from fertilized eggs which have incubated for 9 or 10 days. The surface of the egg is cleaned with iodine or merthiolate and the shell overlying the air space is cracked. The embryo is grasped with a sterile forceps and placed in a sterile Petri dish containing a small amount of salt solution. About 3 eggs are used each time. The embryos are minced with detached knife blades or shears using aseptic technique. The minced embryos are transferred to a 50-cc. sterile heat-resistant test tube and diluted with 4 times their volume of balanced salt solution. The material is agitated and centrifuged. The clear supernatant fluid is drawn off and stored in sterile rubber-capped vials for use in tissue culture.

2. Human cord serum is readily obtained from the obstetrical service. Sterile 250-cc. centrifuge tubes are used for collecting the blood. After clotting of the blood, serum is withdrawn and placed in sterile rubber-capped vials.

3. Dehydrated chicken plasma is obtained commercially. When reconstituted with sterile distilled water, each vial contains 5 cc. of plasma.



4 All glassware and instruments are prepared by thorough cleansing and rinsing in distilled water. These materials are then autoclaved.

**B Tissue culture technic** Small fragments about 1 mm square are cut under sterile precautions from the portion of aorta to be cultured. About 0.4 cc. of chicken plasma is added to a sterile 15-mm. heat-resistant tissue culture tube by means of a drawn capillary pipette with an attached small rubber suction bulb. The plasma is spread over the lower portion of the culture tube. The small fragments of tissue to be cultured usually 8 or 10 in number are placed in the upper portion of the tube with a small thin-tipped pipette. These are placed in a dry portion of the tube and the excess fluid associated with the fragments is sucked off with the thin-tipped pipette. After the excess fluid has been removed the fragments are placed within 0.5 to 1 inch of the bottom of the tube. The tissue in the presence of the chicken plasma produces coagulation and the fragments become adherent to the inner surface of the tube after about 10 minutes. The end of the tube is carefully flamed each time it is entered during this procedure and strict asepsis must be observed throughout the procedure. The tube is then stoppered and as soon as the tissue is adherent to the side of the tube the tube is placed in the roller drum and rotated for 2 hours. The temperature of the roller drum is 37°F. Following this 2 parts each of human cord serum and chick embryo extract plus an equal part of balanced salt solution, are added to the tube. The tubes are checked daily under the low power of a microscope for evidence of fibroblastic proliferation at the borders of the explanted tissue fragments. Fragments of 9- or 10-day chick embryos are cultured at the same time to serve as a control culture.

### EQUIPMENT AND PERSONNEL REQUIRED

#### A. Material for preservation of tissue

1. Balanced salt solution (Hanks modified Tyrode's solution).
2. Human plasma or serum and antibiotic.
3. 250-ml blood-bank bottles.
4. Refrigerator—blood-bank type.
5. Bacterial culture apparatus.
6. Forceps, forceps and detached scalpel blades.
7. Sterilizing equipment.
8. No. 7 rubber stoppers.

#### B. Tissue culture operational procedure

1. Bacteriologic incubator air jacket type stabilized at 37.5 C.
2. Wyble roller tube apparatus.
3. 7-mm heat-resistant tubing for preparing pipette.
4. 15 by 150 mm heat-resistant test tubes.
5. Solutions

Balanced salt solution (identical with that used in preparing preservative media for blood smears).

b. Chick plasma

- c Human cord serum.
- d Sterile Petri dishes (ordinary bacteriologic type).
- e Chicken embryo extract
- f Sterile detached blades and shears
- g A hood is desirable but not essential if a sterile working area is available

*C. Personnel required.* An officer of the surgical service should supervise all details pertaining to the acquisition of specimens. One laboratory officer should be responsible for supervising the blood vessel bank preparation of solutions and all laboratory procedures required. Close liaison should be maintained between these two officers. At this hospital a civilian consultant in tissue culture procedures was engaged. One technical assistant in the laboratory should be available for such details as preparation of media, preparation and sterilization of equipment and performance of bacterial and tissue culture procedures.

## BOOK REVIEW

*Visceral Radiology* by *Emerik Markovits* M. D. Formerly Scientific Collaborator of the Central Radiologic Institute of the General Hospital (Holzknecht-Institute), Vienna, Head of the Radiologic Department of Elizabeth Hospital of the City of Budapest; Postgraduate Lecturer at the Central Radiologic Institute of the University of Budapest; Radiologist of the Seelner Clinic Atlanta, Ga. 612 pages illustrated. The Macmillan Co. New York, N. Y. publisher 1951. Price \$24.

This book supplements *Bone and Joint Radiology* published by the same author in 1949. The author states that it is intended for the diagnostician. The book is divided into the following parts on a basis of systems: (1) the chest and respiratory system, (2) the circulatory system, (3) the digestive system, (4) the abdominal organs and abdomen, (5) the genitourinary system, and (6) the central nervous system. The major subjects are introduced by a concise review of anatomy and physiology. The book contains numerous illustrative roentgenograms supplemented by sketches and drawings illustrating gross radiologic findings and normal anatomy. It also contains many differential diagnostic lists and tables. Apparently for the purpose of completeness some of these are of a general nature and are too lengthy to be of any great value. The volume should be of value to residents and practitioners of radiology but it is not a comprehensive text. It is attractively bound and is printed on good quality paper.

—Col. D. F. Dullam, MC, U. S. A.

## UROLOGY AWARD

The American Urological Association offers an annual award of \$1000 (first prize of \$500, second prize of \$300, and third prize of \$200) for essay on the result of some clinical or laboratory research in urology. The competition shall be limited to urologists who have been in such practice for not more than 5 years and to men *in training* to become urologists. The first prize essay will appear on the program of the forthcoming meeting of the American Urological Association, to be held in Atlantic City, N. J. 23 to 26 Jun. 1952. For full particulars write the Secretary, Dr. Charles H. de T. Shiver, Boardwalk National Arcade Building, Atlantic City, N. J. Essays must be in his hands before 15 February 1952.

# Treatment of Leukemia and Similar Disorders<sup>(1)</sup>

Richard H. Smith *Lieutenant, junior grade MC, U. S. N. R.*

**A**BOUT 10 percent of the annual deaths from cancer are caused by malignant diseases of the reticuloendothelial system (2)

Leukemia is probably a neoplastic disease arising in hematopoietic tissue and consisting of abnormal and widespread proliferation of leukocytes and their precursors in the tissues of the body. It is noted for its rapid progression to death and to date few persons have been observed as apparently cured. At a recent conference on leukemia it was stated that 10 percent of 300 children had spontaneous complete or partial remissions averaging slightly under 10 weeks in duration and that spontaneous remissions occur in from 1 to 2 percent of adults (3). Acute leukemia usually causes death of the patient within from a few weeks to 6 months although the patient with chronic leukemia may live for 10 or more years. Although means are constantly being sought to cure the condition permanently present methods of therapy seldom do more than prolong life for a short time and relieve symptoms temporarily but there have been scattered cases of prolonged remission.

Other conditions involving the blood-forming organs such as Hodgkin's disease, lymphosarcoma, reticulum cell sarcoma, multiple myeloma, and several conditions the histology of which is obscure are usually considered together with the leukemias. The prognosis of these diseases is generally as hopeless as that of the true leukemias. Treatment of the conditions mentioned is similar to that of leukemia.

## TREATMENT

General measures of therapy have not changed materially in the last few years nor have there been many advances in specific measures. It is not my purpose in this review to describe general adjuvant ther-

(1) Presented at the Weekly Staff Meeting of U. S. Naval Hospital Philadelphia, Pa. 16 February 1951.

(2) Erl, L. A.: Treatment of leukemia and allied disorders. Presented at the Annual Convention of the Medical Society of the State of Pennsylvania 1950.

(3) Dameshek, W., Freedman, M. H., and Steinberg, L. F.: Induction of remissions in treatment of cut and subacute leukemia. *Blood* 5: 898-915, Oct. 1950.

peutic methods or to elaborate on the technics of specific therapy but rather to summarize the presently accepted specific methods and some of those still in the early stages of investigation. The main groups of therapeutic agents of proved or promising value include (1) roentgen radiation and radioactive isotopes, (2) nitrogen mustards, (3) urethane, (4) folic acid antagonists, and (5) ACTH and cortisone.

*Roentgen radiation.* Acute, subacute and aleukemic leukemia are not helped by roentgen rays and, in fact, may be made worse by this treatment. Radiation has been implicated as a cause of acute leukemia (4). Total body irradiation is the most satisfactory treatment of chronic myelogenous leukemia, except for patients with splenomegaly in which cases the rays are directed to the spleen (5). Chronic lymphatic leukemia is best treated with localized roentgen rays. Roentgen therapy can prolong life but it should be started as soon as indicated by symptoms or by a leukocyte count of 40,000 or more. The dose must be such that radiation sickness is avoided. Roentgen ray therapy is usually combined with blood transfusions and antibiotics. The average prolongation of life in chronic leukemia is 6 months and the combination of measures controls symptoms for about 85 percent of this time. Radiation is preferred by many in the treatment of Hodgkin disease, lymphosarcoma, reticulum cell sarcoma, and multiple myeloma, and its effects depend on the extent of invasion by the neoplastic cells.

*Radioactive isotopes.* These are given under the same conditions as is roentgen therapy because they are only another mode of administration of radiation, but this method offers wide tissue dispersion, especially important with beta rays, a mild and prolonged effect, and absence of radiation sickness. Of these isotopes radioactive phosphorus ( $P^{32}$ ) has been the one most widely used. It emits beta rays and is given intravenously as the sodium monohydrogen salt in a 5-millicurie dose (from 2 to 2.5 mc. 2 or 3 times a week) until a desirable effect has been obtained, to be repeated in about 8 weeks if needed. It is most quickly absorbed by actively growing cells to retard mitosis. Although its great value is in the treatment of chronic myelogenous and chronic lymphatic leukemia, its popularity has faded. It has little effect in other leukemias. Radiostrontium also produces beta rays but has a dangerous disadvantage in that its half life is 25 years. It is useful in treating superficial lesions with minimal irradiation of underlying tissues (6). Radiosodium emits both beta and gamma rays and is not used clinically. Diamond et al. (7) reporting a series of 71 patients found no benefit from radiation in any of those with acute lymphatic leukemia, those with

(4) March H. C. Leukemia in radiologists in 20-year period. *Am. J. M. Sc.* 220: 282-286, Sept. 1950.

(5) Searles C. C. Recent advances in treatment of hematologic disorders. *J.A.M.A.* 141: 769-773, Dec. 9, 1949.

(6) Hunt, H. B. Role of radioisotopes in blood dyscrasias and neoplastic disorders. *Tex. State J. Med.* 46: 496-503, July 1950.

(7) Diamond H. D., Carter, L. F., Woodward H. Q., and Parks G. H. Radioactive phosphorus. I. In treatment of lymphatic leukemia. *Cancer* 3: 779-788, Sept. 1950.

chronic lymphatic leukemia were treated with P<sup>32</sup>. Five years after the first hospital visit 11.3 percent were still living and 5 years after the onset of the first symptoms 24.5 percent were still alive. The 8-year survival rate of this group was 1.9 and 7.6 percent, respective of the above dates. Lawrence et al. (8) reporting a series of 100 patients with chronic lymphatic leukemia treated with P<sup>32</sup> found 33 living 5 years and 10 living 8 years after the onset of the first symptoms.

**Nitrogen mustards.** Methyl bis (beta-chloroethyl) amine and methyl tris (beta-chloroethyl) amine are powerful cellular toxins which seem to prefer actively growing cells as seen by the leukopenia and bone marrow and lymphatic tissue destruction in those soldiers on whom the toxin was used in World War I. Results in treatment of chronic myelogenous and chronic lymphatic leukemia with them have been fairly good, but the conclusion of many is that nitrogen mustards should be used only when patients with Hodgkin's disease, lymphosarcoma, and reticulum cell sarcoma become refractory to radiation (5, 9). The usual dose is 0.1 mg per kg of body weight given on successive or alternate days for 4 doses. It is administered intravenously being especially careful to avoid venous thrombosis or leakage into the tissues. The total amount should not be more than 24 mg in any one course. One or more hours after injection half the patients become nauseated and have moderate to severe vomiting but this usually disappears within a few hours. These side effects may be decreased by giving 100 mg of pyridoxine intravenously or intramuscularly one-half hour following the injection of nitrogen (9). Pyridoxine and one of its derivatives have themselves been tried in the treatment of leukemia (10). Aromatic and aliphatic nitrogen mustards have been studied (11) and one of them, R48 (beta-naphthyl di 2-chloroethylamine) was tried in several of the chronic forms of these diseases. Five patients with Hodgkin's disease each had one remission following treatment with this drug but two patients with acute leukemia and two with reticulosarcoma showed no remission. Of three patients with chronic myelogenous leukemia one had several remissions and of four patients with chronic lymphatic leukemia two had definite and repeated remissions. The usual dose in these patients was 300 to 400 mg daily the course varying from 2 to several weeks. Fewer toxic effects were noted than with methyl-bis (beta-chloroethyl) amine and the newer compounds were noted to work more slowly and were more easily controlled. Because of the depressant action of all nitrogen mustards on hematopoietic tissues danger-

(8) Lawrence J. H., Low-Beer B. V. A. and Carpenter J. W. J. Chronic lymphatic leukemia: study of 100 patients treated with radioactive phosphorus. J.A.M.A. 140: 585-588 Jan. 18, 1949.

(9) Craver L. F.: Recent advances in treatment of lymphoma, leukemias, and allied disorders. Balkley Lecture. Bull. New York Acad. Med. 24: 3-25, J. 1948.

(10) Gellhorn A. and Jones L. O. Pyridoxine deficient diet and desoxypyridoxine in therapy of lymphosarcoma and cut leukemia in man. Blood 4: 60-65 Jan. 1949.

(11) Mithrew W. B.: Trial of beta-naphthyl di 2-chloroethylamine (R48) in leukemia, Hodgkin's disease and allied diseases. Lancet 1: 896-899 May 13, 1950.

ously low red and white blood cell counts must be guarded against by frequent observation and by regulation of the dose.

**Urethane.** Five years go about 100 years after urethane (ethyl carbamate) was first synthesized, a decreased leukocyte count was noticed in patients treated for malignancy with this drug. It is probably a cellular toxin inhibiting the mitosis of actively growing cells. It is beneficial in treating chronic myelogenous leukemia and of slight value against chronic lymphatic leukemia, but of no value against acute leukemia. Good results have also been reported following its use for multiple myeloma (5, 12). For chronic myelogenous leukemia it can be given combined with roentgen radiation in patients whose symptoms are mild. One dosage schedule is 0.3 gram (1 enteric-coated tablet) t.i.d., the total daily dose being increased by 1 tablet daily until a maximum of 10 tablets daily is attained. The leukocyte count will decrease in from 2 to 4 weeks and, after it reaches normal, a daily maintenance dose of from 1 to 1.5 gram given (5). As in the use of the nitrogen mustards, frequent blood counts and adjustment of the dose are mandatory. The results obtained with urethane therapy do not warrant much hope for its future.

**Folic acid antagonists.** These appear to be the most promising new agents in the treatment of leukemia. Folic acid had been tried in the treatment of pernicious anemia and other megaloblastic macrocytic anemias in its growth-promoting capacity and it was assumed that agents antagonistic to the growth factor could be applied to the immature cells of acute leukemia (13-15). After trial with folic acid and trifolic acid the next step was to propose that an antagonist of folic acid be synthesized to replace folic acid in order to inhibit growth. Hence slight changes were made in the folic acid structure to produce 4-aminopteroylglutamic acid and other compounds. Folic acid antagonists produce deficiency of folic acid which may be irreversible as proved in animals (16). The mechanism may be the prevention of the conversion of folic acid into a more active compound or there may be a specific direct effect of the folic acid antagonists on cell growth. Dosage has been established by Farber (17) as 0.5 to 1 mg. daily for aminopterin.

(12) Leger, P. E., and Rundles, R. W. Urethane therapy in multiple myeloma. *Blood* 4, 201-216, Mar. 1949.

(13) Symposium. Effects of derivative of folic acid on certain type of neoplastic disease. *T. New York Acad. Sc.* 10: 68-103, Jan. 1948.

(14) Farber, S. and others. Temporary remission in case leukemia in children produced by folic acid antagonist, 4-aminopteroylglutamic acid (aminopterin). *New England J. Med.* 238: 787-793, June 3, 1948.

(15) Daneshmand, V. Chemotherapy of "lymphoma" and leukemia. *Bull. New England M. Center* 11: 49, Aug. 1949.

(16) Franklin, A. L., Seakins, E. L. R., and Jakes, T. H. Observations on effect of 4-aminopteroylglutamic acid on mice. *Proc. Soc. Exper. Biol. & Med.* 67: 398-400, Mar. 1949.

(17) Farber, S. Some observations on effect of folic acid antagonists on case leukemia and other forms of incurable cancer. *Blood* 4: 160-167, Feb. 1949.

3 to 5 mg daily for  $\alpha$ -methopterin and 25 to 50 mg daily for amio-anfol Farber et al (14) and later Dameshek (3, 15) observed dramatic remissions of acute and subacute leukemia in children and adults using these drugs. Complete remission may occur in from 25 to 60 percent of the children treated and last from 6 weeks to 2 years which is a big step forward in the management of this otherwise rapidly progressive disease. Repeated remissions have occurred (18). The remission rate in adults with leukemia so treated has been much lower (19, 20). There is in every case the danger of folic acid deficiency. This can be prevented by administering folic acid or trifolic acid before giving the folic acid antagonist but is only partially prevented if the folic acid is administered later (21). A compound has been isolated which is necessary to the growth of a certain species of bacterium and is designated as the citrovorum factor. According to recent work (22) this factor seems to be several times more active than either folic acid or trifolic acid in blocking the deficiency-producing action of the folic acid antagonists and hence can prevent the chemotherapeutic effects thereof (23). Still more recent observations show that the citrovorum factor can be used in folic acid antagonist therapy to prevent only the toxic symptoms (22). The dosage is not yet established.

*ACTH and cortisone.* Possibly as promising as the folic acid antagonists are these two drugs, the action of which is still not completely known despite intensive research by many workers. Physiologic effects are the same as in other patients. The usual dose administered is from 100 to 300 mg of cortisone and 200 mg of ACTH for adults and 50 to 75 percent of the adult dose for children. It is given continuously for about 25 days if possible in one course (24). The results obtained so far have been almost as good as those obtained with the folic acid antagonists with the added advantage of a high percentage of remissions in patients with the chronic leukemias Hodgkin's disease and lymphosarcoma. In some patients there were several successive remis-

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(19) Nigh R. B. Berthell F. H. and Meyers M. C. Effect of pteroylglycine acid inhibitor in leukemia and related disorders. *Am. J. Med.* 3: 624, May 1948.

(20) Heale R. W. Treatment of acute leukemia in childhood. *Ohio State M. J.* 46: 133 Feb. 1950.

(21) Weber, E. J. et al. Treatment of acute leukemia of childhood with folic acid antagonists. *J. Pediat.* 36: 69 J. 1950.

(22) Schoenbach E. B.; Greenspan E. M. and Colsky J.; Removal of misopterin and  $\alpha$ -methopterin toxicity by citrovorum factor. *J.A.M.A.* 144: 1558-1560 Dec. 30 1950.

(23) Burchenal J. H.; Babcock G. M.; Broquist, H. P. and Jukes T. H. Prevention of chemotherapeutic effects of 4-amino-N(10-methyl-pteroylglycine) acid on mouse leukemia by citrovorum factor. *Proc. Soc. Exper. Biol. & Med.* 74: 735-737 Aug. 1950.

(24) Stickney J. M.; Heck, F. J. and Wilkins C. H. Cortisone and ACTH management of leukemia and lymphoblastoma. *Proc. Staff Meet. May Clin.* 25: 488-489 Aug. 16 1950.



sions (25) and in others second remission could not be induced (24, 26). A favorable reaction consists of an increase in peripheral reticulocytes and in marrow normoblasts possibly an increase in the erythrocyte count and hemoglobin, and return of the differential leukocyte count to normal. The severe cytotoxic effects of folic acid antagonists have not been cited, but there may be moderately severe leukopenia. In patients with chronic lymphatic leukemia, Hodgkin's disease and lymphosarcoma there may be regression in the size of lymph nodes, liver and spleen with or without microscopic changes in specimens taken at biopsy. Patients having a remission usually begin to experience subjective improvement within 2 or 3 days. Remissions last from 2 days to many weeks.

**Other drugs.** Several other drugs may be mentioned briefly because of limited use and questionable value. Colchicine has been shown to interrupt cell growth in mitosis. Bacterial polysaccharides have been tried without much effect. Stilbamidine (27) and antimony (28) produce a slight clinical improvement in multiple myeloma. Replacement transfusion is popular in some circles in the specific treatment of acute leukemia. Normal and polycythemic blood may contain an antileukemic factor (29). One patient with acute leukemia had several remissions over an 18-month period during which time 168 transfusions and 19 exchange transfusions were performed and both urethane and aminopterin were used, but he eventually died (30). In another patient partial exchange transfusion gave a better remission than did the previous administration of aminopterin (31). In a more complete analysis Bessis and Dausset (32) using this method produced temporarily 12 complete remissions and 30 partial remissions in 60 patients with acute leukemia.

(25) Spies T. D.; Stone R. E.; Garcia López G.; Milases, F.; Lopez Teich R. and Rehder, A. Response to adrenocorticotrophic hormone and cortisone in persons with carcinoma, leukemia and lymphosarcoma. *Lancet* 2: 241-244, Aug. 12, 1950.

(26) Penzance, O. H. and Eliel, L. P. Metabolic effects of ACTH in acute leukemia. *J. Clin. Investigation* 29: 838-839, June 1950.

(27) Propp S., Gorkham, L. W. and Kasser S. Recent studies of multiple myeloma: survival and rib fracture and the results of treatment with stilbamidine. *Blood* 4: 36-53, Jan. 1949.

(28) Rabinowitz M. A. Use of antimony in multiple myeloma. *Blood* 4: 1068-1072, Dec. 1949.

(29) Hensell, H. H. et al. Replacement transfusions in treatment of acute leukemia. *Ann. N. Y. Acad. Med. & Surg.* 3: 371, Nov. 1949.

(30) Catina R., Bessis M. and Ely Z. Leucémie aiguë traitée 66 pendant 18 mois seulement par 19 échanges-transfusion et 168 transfusions. *Bull. et mém. Soc. méd. hôp. Paris*, 65: 1109-1122, Oct. 14, 1949.

(31) Bessis, R. T. and Schormpfer, C. B. Effets d'un échange de sang partiel en cas de leucémie aiguë. *Ann. Int. Med.* 32: 123, Jan. 1950.

(32) Bessis M. and Dausset, J. Étude critique des rémissions courtes des leucémies aiguës traitées par échange-transfusion (comparaison avec les rémissions post-traitées et celles induites par les antagonistes de l'acide folique). *Rev. Hépat.* 5: 188-225 1950.

TABLE 1 *Treatment of choice for the leukemias and related diseases*

Disease	Therapy in order of choice	Dosage	Effect of therapy
Acute and subacute leukemia	Folic acid antagonists Aminopterin A-methopterin Amino-an-fol ACTH Cortisone	0.5-1 mg 3-5 mg 25-30 mg. 200 mg. 100-300 mg	{ Partial to complete remission in 30-50% for few wks to 2 yrs
Chronic myelogenous leukemia	Spray roentgen rays (except local for splenomegaly) Radioactive phosphorus  Urethane	15-20 r daily or every other day 5-7 mc. intravenously repeated in 6-8 wk. if needed Up to 3 gram daily until remission then 1.15 gram	Prolongs life for about 6 mo. and relieve symptoms Short to long remission Similar to but less than effects with radiation
Chronic lymphatic leukemia	ACTH Cortisone Local roentgen rays	{ As above 50-100 r every other day	{ No better than other treatment Prolongs life 6 mo. 2 yr. and relieve symptoms
Hodgkin's disease	Roentgen rays Nitrogen mustard  ACTH Cortisone	Highly individualized 0.1 mg per kg intravenously on 4 successive or alternate day { As above	Prolong life 2 or 3 yr Prolongs life a few weeks to a year with relief of symptoms { No better than other treatment
Lymphosarcoma	Roentgen rays  Nitrogen mustard  ACTH Cortisone	Individualized Same as for Hodgkin's disease { As above	Short prolongation of life with partial remission Same as for Hodgkin's disease { No better than other treatment
Reticulum cell sarcoma	Roentgen ray  Nitrogen mustard  ACTH Cortisone	Individualized Same as for Hodgkin's disease { As above	Same as for Hodgkin's disease Same as for Hodgkin's disease { No better than other treatment
Multiple myeloma	Roentgen rays  Scilbemidine  Urethane	Individualized 50-150 mg daily total 4-5 grams Not generally used	Relieves local bone pain Slows progress and relieves pain Slight clinical improvement

## SUMMARY

Treatment of leukemia had not been very successful with radiation or with any drugs until the fol c acid antagonists ACTH, and cortisone were developed. The former gives a fair number of temporary remissions in patients with cure leukemia and the latter two give remissions in patients with acute or chronic leukemia and in some of the related diseases. The disease in some patients with Hodgkin's disease lymphosarcoma, and reticulum cell sarcoma has been successfully retarded for weeks with radiation and nitrogen mustards. Table 1 lists the more widely accepted specific treatment for each of these diseases.

## BOOK REVIEW

*Bacteriological Technique, Guide for Medical Laboratory Technicians* by W. S. F. McEwen, A. L. M. L. T. F. R. M. S., Bacteriologist, Meara Lantigen (Eng.) Ltd. Late Chief Technician and Lecturer in Bacteriology Nottingham and District Technical College Nottingham; with foreword by Professor Sir Alexander Fleming, F. R. C. P. F. R. C. S. F. R. S. 293 pages 70 illustrations Chemical Publishing Co. Inc. Brooklyn, N. Y. publishers 1950.

McEwen's guide for medical laboratory technicians is the answer to many of the perplexing problems that arise daily in most laboratories. The author's experience and ingenuity in coping with the technical problems of the bacteriologic laboratory through the years are recorded in facile style. This text is highly recommended to all who are concerned with setting up a bacteriologic laboratory. Too frequently little thought is given to such important problems as a cleaning and preparation room, a separate media room or kitchen, the type of flooring necessary to good sanitation, the proper height of laboratory work benches and adequate hot and cold water supply draining racks and bowls, if animals are used how to set up an animal room properly.

A good share of this book is devoted to the proper care of laboratory equipment and glassware. Many valuable suggestions are given on the means of fabricating special equipment. Numerous figures many of which are by the author aptly supplement the text and should excite the reader's ingenuity in evolving contraptions of his own to fit the many problems which arise in every laboratory.

Many laboratory manuals are written primarily for the college or medical student but this one is written for the technician in the field and helps to fill a large gap in our literature.

—*U.S. Albert Lebovitz, M.S.C. U.S.A.*

# Defensive Medical Aspects of Biologic Warfare

Matthew J. Hantover *Captain, MC, U. S. N.*

THE awareness of and need for defensive measures against biologic warfare is appreciated by most people associated with the medical sciences. The medical defensive aspects are similar whether infection is spread by a natural or an artificial mode of propagation. The methods and techniques involved in preventing the transmission of disease in the usual manner should apply also to the artificial transmission but more rapid detection and identification is necessary in the latter case.

The deliberate use of bacteria, viruses, rickettsia, fungi and toxic agents derived from living organisms to produce death or disability in man, animals and plants requires quick detection and identification so that adequate control measures may be instituted to protect personnel and prevent epidemics. Any delay in determining the agent used will delay specific preventive and therapeutic measures and prolong the epidemic. It may be necessary to begin therapy based on signs and symptoms alone before laboratory reports are available. Development of rapid detection and identification methods involving special techniques or devices is however necessary to expedite scientifically sound therapy to replace empirical treatment. The decontamination of personnel and terrain is essential to prevent the development of secondary aerosols and contagion. The unfavorable aspects of biologic warfare stem from ignorance of cause and effect and they may be prevented by educational means to insure an understanding of modern precepts of preventive medicine.

With other bureaus and departments of the Armed Forces, medical and allied science officers should coordinate their efforts to eliminate infection and disease. They should assist in the training of personnel in detection and identification, protection, prevention, decontamination and treatment of casualties resulting from biologic warfare and at the same time evolve psychologic methods to prevent fear, anxiety and hysteria. Because the most important intended victims of biologic warfare would be man and his food sources, it is necessary to evolve

methods of protection for both. Planning for defense should consist primarily of such basic and practical considerations as will (1) insure the survival of persons so that they may carry out their assigned missions and (2) insure research and development in the various phases of biologic warfare which would help to minimize the effect of an attack.

The objectives of biologic warfare defense are concerned with: (1) knowledge of the offensive possibilities of an enemy; (2) recognition of an attack; (3) detection and identification of the agent used; (4) individual and collective protection; and (5) treatment, decontamination, and psychological therapy.

In order to promulgate defensive measures we must be aware of the agents used, methods of transmission, availability and productive capacity of the enemy immunologic response and character of weapon overtly or covertly used. Intelligent agencies should present to proper authorities all pertinent available information that would enable us to prepare for any and all eventualities. It is necessary to cooperate with the civil authorities in all matters pertaining to the health and well-being of the people. There must be integration of ideas and methods between the Federal, state, local and military authorities to minimize the effects of such an attack. We must train sufficient personnel in the prevention of spread and in the protection of the individual and the masses. We must know when, why, where and how to isolate patients in order to break the chain of infection, prevent spread of diseases and curtail panic. We must detect and identify the agent or disease by (1) sampling of water, food, air, animals and other vectors; (2) clinical means; and (3) laboratory examination of the tissues, fluids of the victims. We must know how, why, when and where to decontaminate and we must endeavor to procure a common decontaminant that will make the contaminant inert.

Accredited laboratories are essential and have as their primary objective detecting and identifying the agents used by the enemy so that adequate and specific remedies can be used. They also assist in research and development of new methods in combating disease. Laboratories of the military establishment and of the Public Health Service, state and local health departments must coordinate their efforts to get the job done expeditiously. Trained and qualified sanitary and epidemiologic personnel are also an integral component of the biologic warfare defense organization.

The basic method of aerosol cloud detection is air sampling for micro-organisms. A wide variety of instruments such as cotton impinger, liquid impinger or bubbler and recently developed filters are available for this purpose. The cotton impinger is designed to filter air through cotton. Suspended organisms being trapped on the filter may then be recovered and identified. The cotton impinger consists of facer pellets of cotton packed in a glass holder. The glass holder is a tube tapered at one end to a small bore to which is attached a small

hand pump. A one-hole rubber stopper with a section of glass tubing is attached to the larger bore end. A small section of wire gauze is placed in front of the cotton in the impinger so that there will be more even distribution of the particles on the cotton. The impinger must be sterilized and cotton-stoppered to keep it sterile. In preparation for immediate use the cotton stopper in the small bore end of the tube is removed and the hand pump is attached. Then the cotton stopper in the glass tube and the rubber stopper are removed and the sample taken. After the sample is taken the pump is removed and the sample is properly sealed by a rubber policeman. It is placed in a sample mailing case and sent to the laboratory for identification. The cotton impinger is believed to be the most practical method of sampling air containing sporulating organisms. It is not very useful however for the collection of vegetative forms.

The bubbler consists of a 50-ml round-bottomed distilling flask with a side arm and a straight glass tube with a small bulb blown onto one end. About 25 holes are punched through this small glass bulb and the tube is then fitted with a one-hole rubber stopper and plugged into the flask. Ten milliliters of chlorine-free water are placed in the flask and the small bulb of the straight tube is brought below the surface of the water. Air is evacuated from the side arm by means of a small hand pump and the organisms are trapped in the liquid. Other filters and microbiometers are being developed for more rapid detection and identification. Cotton swabbings of the nares, throat, mouth, eyes, ears and skin may be used to advantage as a tool for detection. Tests have shown that best results are obtained from those of the mouth.

The effectiveness for direct defensive purposes of detecting the presence of a cloud of pathogens will vary with the incubation period of the diseases. For several potential biologic warfare agents with long incubation periods early detection should give ample warning and lead to effective control measures. If the incubation period were shorter than the time necessary for identification the first indication that a biologic warfare attack had occurred probably would be a definite case of the disease. Even if the incubation period for the specific agent used were short an effective detection grid would provide necessary information as to the distribution and concentration of the agent. A detection grid is any system of detection devices which would collect or provide the necessary information on the probable presence of a disease agent.

The reporting of cases of diseases as caused by a biologic warfare attack would be necessary to provide effective treatment and to limit the spread of the disease. A system for such reporting should be based on the routine morbidity reporting mechanisms maintained by existing military and health agencies. It depends primarily on physicians, hospitals and diagnostic laboratories in the community but might have to be supplemented by using wardens to report the number of

persons ill in their areas and developing studies of absenteeism from industries and schools. Evidence against covert biologic warfare attack may thus be ascertained. There must be a central focus toward which all data pertaining to biologic warfare attacks may be directed. Statistical interpretations must be correlated so that a true picture can be formed and the necessary means taken to prevent spread of the disease.

Protection against a biologic warfare attack must include both individual and collective means. Personal protection consists of respiratory protector such as (1) masks canisters and hood (2) protective clothing and (3) active and passive immunization. Active immunization offers by far the most effective defense against biologic agents for which vaccines are available. Vaccines which are only partially effective might also be widely used because they probably would reduce the incidence of disease from a specific agent or reduce the duration of infection. Multiple vaccine containing a variety of antigens in relatively small amounts so that one course of immunization would protect against variety of biologic warfare agents may be developed.

Collective protection is an endeavor to prevent morbidity and mortality to a population by the use of shelters that are impervious to biologic warfare agents. The shelter must be equipped with positive pressure and must have adequate filter (including impingers, electrostatic precipitators and bubbler) a detection device. The designing of air-conditioning unit with filters or electrostatic precipitators so that optimum protection from overt and covert attacks can be given in critical target areas is necessary.

Decontamination should be carried out by the sanitary services. Flushing with fire hose would in large measure decontaminate the ground and external surface of buildings. In selected instances hypochlorite solution or other readily available and cheap disinfectants might be used effectively. For indoor decontamination, impingement washing of wall and floors, triethylene glycol vaporizers, ultraviolet-ray apparatus and airing and sunning of rugs, draperies and furniture would be the simplest procedures. Decontaminating the aerosol cloud by artificial wind machines blowing it away from critical target areas may become necessary.

Each disease, whether caused by biologic warfare agents or not, must be treated by appropriate measure. Because the portal of entry of biologic agent may vary, bizarre symptoms may result. The usual methods for combating diseases should be applied.

We should inform the people of the cause and effect of biologic warfare agents and transform the unknown to known. The signs and symptoms of the diseases suspected should be described in simple language and prophylactic and therapeutic measures advocated so that the chain

of infection can be broken and secondary cases prevented. It is important that information on the immunization program be widely circulated and control measures instituted at the earliest moment in order to curtail spread and allay panic.

### CONCLUSIONS

The main endeavor in biologic warfare defense is to understand the cause and effect of disease entities and to acquire means of early recognition and treatment. It is essential that those so indoctrinated learn to detect and identify biologic agents and prevent infection to themselves and others. Decontamination and sterilization procedures should be applied to protect oneself and others and prevent secondary cases from developing. Medical officers should participate in the immunization and chemotherapeutic program in the prophylaxis prevention treatment decontamination and sterilization phases and assist and instruct the allied science officers and men. Treatment should depend on the clinical symptoms animal and egg inoculations serology cultures and autopsy findings and will consist of appropriate supportive and chemotherapeutic measures as well as the psychologic measures to allay panic.

### BOOK REVIEW

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**Bacterial and Virus Diseases: Anti sera Toxoids Vaccine and Tuberculin in Prophylaxis and Treatment**, by H. J. Parish M. D., F. R. C. P. E. D. P. H. Clinical Research Director, Wellcome Foundation Ltd. formerly Bacteriologist, Wellcome Research Laboratories 2d edition. 204 pages, illustrated. The William and Wilkins Co. Baltimore Md. publisher 1951 Price \$2.50

The title of this small book is somewhat misleading because it deals exclusively with the agents used for producing active and passive immunity to infectious disease and their methods of administration. It also covers antivenoms and antigens that are used primarily in diagnosis. This useful book combines in one place material that is scattered in standard texts on medicine and bacteriology. It is clearly written. The section on antisera is excellent but some of the other subjects are less adequately covered. Although many references are given both general and specific these are not complete enough to permit this book to be used as a source of reference material. Although the author has attempted to cover American as well as British practice in many instances differences are not pointed out including procedures used by the Armed Forces.—Capt W. Franklin, MC A. U. S.



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# The Orthopedist in Above-the-Knee Amputations

Lawrence E. Abt, Ph. D. (1)

Aaron Stern M. A. (1)

AS A RESULT of an intensive research program which has sought to investigate the factors involved in prosthetic design, fit, use and adjustment many crucial problems have been considered and raised concerning the role of the orthopedist in affording maximum treatment to the above-the-knee amputee. It was the intention of our group to investigate the surgical technique postamputation healing practices limb-fitting considerations clinical personality findings, and consultation practices with the limb-making industry revealed by a representative sample of orthopedists as expressed through the medium of a questionnaire.

Under the original contract between the Department of the Navy Special Devices Center Office of Naval Research and New York University the Research Division of the College of Engineering was called on to design a biomechanical knee for inclusion in a leg prosthesis. Gradually as the scope of the project broadened and the engineers became sensitized to new methods of studying their problem the importance of studying the person who wears the prosthetic device forced itself on their attention. What they had originally considered as a complicated engineering problem emerged as an even more complicated study in *human engineering*.

In conducting research on the problems of above-the-knee amputees, we have sought information from all groups who have had experience in this field. For a full understanding of the problem, it is necessary to accumulate interpret and understand the opinions attitudes and experiences of these various groups. The initial step in this experimental approach consisted of a study dealing with the amputees themselves. In conducting this study we distributed a questionnaire to a representative sample of 128 above-the-knee amputees, and the information was collected and reported (2). Some problems were answered and

(1) Research Division, College of Engineering, New York University

(2) Report No. 80.07: Report of the Questionnaire Survey of 128 Above-the-Knee Amputees. Research Division, College of Engineering, New York University, New York, N. Y.

many new ones raised on the basis of this study. The second step was to accumulate corresponding information from orthopedists who have specialized in the field of above-the-knee amputations a combination and as a result in the further understanding of the data collected from amputees. In conducting this study we distributed questionnaires to a representative sample of 68 orthopedists and the information was collected and reported (3). Much valuable information was accumulated in this phase of the program. The final step in this approach was coordinated questionnaire study accomplished with the limb-making profession. In line with our objectives a representative sample of 69 qualified members of the limb-makers industry was interrogated by means of questionnaire and the data have been collected, organized, interpreted, and presented. (4).

In order to understand any diversity of opinion more completely and to isolate those areas in which there is a community of thinking, this questionnaire survey technique was adopted. It is our purpose in this report to compare the responses obtained from the amputees, limb-makers and surgeons who participated in the studies dealing with the engineering, psychological, medical and limb-fitting factors involved in above-the-knee amputation. The material reviewed here is a composite of information originally collected from three interdependent studies. In this report we attempt to integrate the data which were presented in the several reports and to bring these data together by means of series of interpretations. It is believed that these findings will be of wide interest to physicians who may have occasion in their own professional experience to work with other paramedical groups which also serve their patients.

## FINDINGS

### *Surgeon-amputee considerations*

The orthopedist indicated that in above-the-knee amputations most patients reported some mild pain but only during the early postoperative stages of healing. This finding, however, was not substantiated by the responses obtained from the amputees who reported pain in their stump as a result of: (1) walking or wearing the limb for a sustained period of time (2) changes in the weather and (3) stump rashes resulting from irritation caused by the prosthesis. In light of these data it is reasonable to suspect that ample opportunity may not often be provided the amputee to consult with the surgeon following the initial period of hospitalization.

Concerning the amputee's major complaints with reference to artificial limbs, the responses from the orthopedists and the amputees showed

(3) Report No. 80-08: Report of the Questionnaire Survey of 68 Orthopedic Surgeons. Research Division, College of Engineering, New York University, New York, N. Y.

(4) Report No. 80-09: Report of the Questionnaire Study of 69 Limb-Makers and Limb-Fitters. Research Division, College of Engineering, New York University, New York, N. Y.

good deal of communality of thinking (table 1) Both groups listed inadequate knee control improper fit, and excessive weight as being significant flaws in the prostheses available today but the groups differed in that the amputees stressed improper alignment as constituting another significant deficiency while the surgeons cited stump rashes and irritations This last difference is easily understood in light of the types of experience afforded each of the two groups

TABLE 1. *Major complaints about artificial limbs*

Complaint	Percent in each group responding		
	Amput	Orthopedist	Limb-maker
Inadequat knee control _____	25	10	16
Improper fit _____	17	20	18
Improper alignment _____	13	0	10
Too heavy _____	17	15	5
Too noisy _____	8	0	0
Inadequat belt control _____	6	0	15
Stump pains and irritations _____	0	16	0
Too bulky _____	0	10	0

With respect to the manner in which artificial limbs can be improved, both groups advocated the development of a better system of knee control and a reduction in the weight of the prosthesis. A difference in the thinking of the amputees as compared to the orthopedists was evidenced however by the limb-wearers' further concern over the technique of limb alignment, while the surgeons sought wider use of the suction socket as a means for increasing the effectiveness of above-the-knee prosthetic appliances

TABLE 2. *Factors making for efficient use of artificial limbs*

Factor	Percent in each group responding		
	Amputee	Orthopedist	Limb-maker
Psychological factor _____	29	46	43
Different physiology _____	22	20	24
Better fit _____	20	9	18
Practic _____	10	0	0
Instruction (training) _____	11	7	7
Age difference _____	0	9	6

In accounting for the reasons why some amputees get poorer use from their prostheses than others both groups agreed that differences in personality physiologic make-up and fit were the basic determining factors. Almost one of every two orthopedists who responded to this item of the questionnaire (46 percent of the responses) stressed in-

save as much of the leg as possible would be superseded by new formula which calls for the preparation of the stump in order to fit effectively the most suitable prosthesis.

The attitude of the surgeon towards the limb-maker is exemplified by the respondents from this profession who considered only 12 percent of the limb-makers as being qualified to fit a prosthesis without medical supervision. The rest recommended that at least general surgical supervision be enforced in all cases of limb-fitting. This attitude provides another indication of the thinking exhibited by both groups each of whom seeks the dominant position of supervisor over the other's activity rather than the role of one engaged in a reciprocal alliance calling for aid and cooperation. Both the limb-maker and the orthopedist considered an adequate program of training as being of paramount importance in determining the level of achievement which the amputee will acquire in the use of his artificial limb, but neither group offered any significant suggestions concerning the organization of an efficient training program. There are apparently few reliable data available at this time which deal with the techniques for prosthetic training.

It is interesting to note the almost perfect agreement between the limb-maker and the orthopedist in accounting for the reasons why some amputees get better use from their prostheses than others. Both groups recognized individual psychologic differences, difference in physiologic status and differences in fit of the prosthesis as being the key factors which determine the manner in which an amputee will be able to use his prosthesis.

#### *Amputee and limb-maker considerations*

A comparison of the responses of the amputee with those of the limb-makers in describing the chief faults which are asserted to exist in artificial limb revealed that both groups agreed on the relative inadequacy of present fitting techniques, knee control and alignment of prostheses but showed a difference in emphasis concerning the importance of weight and the use of the belt suspension system (table 1).

Regarding suggested improvements for the present types of artificial limbs we found a greater concentration of responses evidenced by the amputees. Although they did not emphasize more efficient fitting of the appliance this issue was the most common suggestion offered by the limb-makers. During the course of conducting an inquiry among limb-makers and limb-fitters, manufacturers of many different types of prostheses were contacted. This fact helps to explain the variety of suggestions offered by this group for the improvement of artificial limbs. It is reasonable to assume that each person cooperating in the research project used the artificial leg developed by his own organization as a frame of reference for his comments about and evaluations of other prosthetic devices.

In explaining why some amputees get better use from their prostheses than others we found great similarity in the thinking of the amputee and limb-maker (table 2). The responses of amputees and limb-makers were alike or similar with respect to (1) psychologic factors (2) physiologic factors (3) fix differences and (4) practice and training. Although 97 percent of the limb-makers indicated that information is provided the amputee concerning the difficulties that are commonly experienced only 43 percent of the amputee group indicate that they had been told how to overcome the troubles commonly experienced. This situation introduces the possibility that the limb-maker is not using adequate means for conveying the information to the amputee or suggests that he may offer only descriptive information concerning the troubles encountered with artificial legs without providing suitable suggestions concerning the manner in which these obstacles can be overcome.

Both groups attached great importance to the development of an efficient training program, indicating that this process is of paramount importance in determining the skill with which an amputee can use his prosthesis. The amputee and the limb-maker considered the training programs now being conducted as ineffective owing to a lack of sufficient time available for the learning experience. Neither group offered any concrete suggestions however for the development of a more useful training program.

The attitude of the amputee toward the limb-maker showed much hostility. Thirty-six percent of the limb-wearers implied that the limb-maker was not adequately trained for his job and most of the group rate the limb-maker or limb-fitter as being only fairly efficient. The attitude of the limb-maker towards the amputee on the other hand was a positive one in which he indicated that the amputee was generally helpful in the execution of his task.

#### *Amputee—surgeon—limb-maker considerations*

The data which were made available as a result of these questionnaire surveys make it possible to develop direct comparisons among the responses obtained from the amputee, the limb-maker, and the orthopedist in a number of areas. All three groups offered information concerning the limb-wearer's major complaints with reference to his artificial leg and these varied from group to group in accordance with the interests of the group and the type of contacts which its members experienced in working with prosthetic appliances and amputees. In comparing the data, we found that each group emphasized different areas in citing the chief complaints of the amputee.

In the fact that the limb-maker and orthopedist were not in agreement with the amputee is a suggestion that there is incomplete understanding on the part of the two groups concerning the problems of the limb-wearer. That the limb-maker and orthopedist disagreed with each other

is an indication that these two groups are not working from the same point of view and are approaching the problem from different interests. Such different orientation to a given situation is a desirable relationship but only if the various points of origin eventually come together at a common focal point to the advantage of the patient.

Concerning the question of improvements in the present artificial leg we found greater agreement in the thinking of the three groups (table 4). All three groups were consistent in their belief that a reduction in the weight of the prosthesis and improvement of the knee mechanics in the direction of greater control would be highly desirable.

TABLE 4. Improvements suggested for artificial limb

Suggestion	Percent in each group responding		
	Amputee	Orthopedist	Limb-maker
Better knee control _____	40	19	9
Better fit _____	0	20	7
Better alignment _____	13	0	9
Reduction in weight _____	17	22	14
Better foot joint _____	15	0	0
Better instruction _____	6	0	0
Better maintenance _____	9	0	0
Use function socket _____	0	19	0
Less bulky harness _____	0	10	0

The area which demonstrated marked community of thinking on the part of the amputee, the limb-maker and the orthopedic surgeon was found in response to the question of why some amputees get better use from their prostheses than others. Here we found that all of the three groups participating in our research stressed in the same order of importance (1) individual psychologic differences, (2) individual physiologic differences, and (3) differences in the fit of the prosthesis.

The only other problem for which we could draw direct comparisons concerning the responses of the three participating groups dealt with the matter of training in the use of the prosthesis. For the amputee the limb-maker and the orthopedist formal training was regarded as being a vital phase of the process of learning to use a prosthesis efficiently and on about which little information was being offered and for which practically no significant suggestion could be provided at this time.

## CONCLUSIONS

There have been trends in our data which indicate that the amputee, the limb-maker and the orthopedist have been acting independently on the problems of prosthetic servicing and fit, and that each has not

coordinated his services with the other in an attempt to provide the greatest good for the greatest number. If this research has done nothing more than to point out the need for closer cooperation among the persons surveyed, then we may regard it as having made a significant contribution to the problems involved in prosthetic services.

There appears to be a marked need for the limb-making industry to develop its relationships with amputees. The amputee at present doubts the ability of the limb-maker, attacks his policies as being mercenary, and does not consider his skills as operating at their most efficient level. Such discord as evidenced by the amputees' attitude towards the limb-making profession certainly seems to indicate a need for the limb-maker to promote a campaign designed to investigate the cause of the present relationship, if it does truly exist, and also to develop a better understanding between the limb-making and limb-wearing groups. There can be little measure of success if the situation is permitted to continue with misconceptions of the problems involved in prosthetic services by these two groups who must work so closely together.

From the data provided by surveys, there can be little doubt that the training program is a vital phase in the process of efficient application and adjustment to a prosthesis. It is a phase, however, about which relatively little is known. The question of training can well be the subject for a separate program of research.

This study represents only a small beginning to the entire problem of organizing and pooling the thinking of the amputee, the limb-maker, and the orthopedist. It is evident, however, from the little evidence that we have assembled that there is an immediate need for further studies of the type of thinking and activities which prevail in each of these groups which are so intimately concerned with the processes of amputation and limb-fitting.

## BOOK REVIEW

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*Gynecologic Cancer*, by James A. Cornsden, Ph. B., M. D., Professor Emeritus of Clinical Gynecology, College of Physician and Surgeons, Columbia University. Attending Gynecologist, Sloane Hospital for Women, New York, N. Y. Thomas Nelson & Sons, New York, N. Y. publisher 1951. Price \$6.

This book is an excellent and comprehensive monograph on cancer in the female reproductive organs. The introduction stresses the frequency of this condition and points out that the accessibility of these structures favors the application of diagnostic procedures so that diagnosis can be made in the early stages of the disease when cure is possible in a high percentage of patients. All known procedures used



diagnosis are described in detail and evaluated. The author stresses that in any case of abnormal uterine bleeding the diagnosis must be established before treatment of any sort is instituted. The place of the newer technic in diagnosis is definitely delineated and the necessity for confirmatory evidence by biopsy and curettage is stressed.

Cancer of the cervix is exhaustively dealt with, the significance of the controversial carcinoma *in situ* is described, and the necessity for giving it a separate classification is explained. All known methods of therapy are described in detail including the various technics of irradiation therapy. The advantages and disadvantages of the different types of treatment are described and an evaluation of radical surgery is presented, together with a summary of results, complications, mortality and morbidity resulting from both surgical and irradiation therapy.

The frequency of adenocarcinoma of the uterus in women who have had abnormal bleeding near the menopause is pointed out, together with the necessity for diagnostic curettage in all such patients if the disease is to be diagnosed in curable stage. The best results in the treatment of carcinoma of the uterus have been obtained by a combination of radiation and surgical therapy. The author recommends from 5 000 to 7 000 mg.-hour of radium (which is more than is generally used) and points out that there is room for great improvement in radiation technic.

The chapters on chorion carcinoma, carcinoma of the tube and ovarian neoplasms are concise and well written and constitute an excellent review of these subjects. One chapter is devoted to the management of the cancer patient and covers the entire gamut of available aids in palliative therapy with evaluation of each procedure. This excellent chapter should be read by anyone who treats gynecologic cancer.

The author states that gynecologic cancer cure rates can be elevated from the present value of from 20 to 25 per cent to from 85 to 90 per cent with treatment techniques now available provided early diagnosis is made and proper treatment carried out. The bibliographies at the end of each chapter are complete and, not all important references are listed. The book is well arranged, excellently written, printed on high-quality paper and is well illustrated.

—Lt. Col. E. A. Akers, MC, U. S. A.

# Dental Service in Korea

Robert H. Marlette *Captain, DC, U. S. A.*

**J**OINING the 24th Medical Battalion on 9 January 1951 I was fortunate enough to be attached immediately to the highly regarded 5th regimental combat team as the regimental dental surgeon. The dental health of the command became my responsibility—a duty which I realized should not be considered lightly. To many of the young men recently graduated from shining laboratories of the dental schools an introduction into Army field life may well come as a rude shock. The operation of an efficient well organized dental clinic 3 miles behind the fluctuating front lines may seem at first glance an impossibility. My purpose in this article is to clarify a possible misconception and through the experience gained in practicing dentistry under the rigorous conditions of combat to disseminate the methods and means of our operations in the field.

Equipped with a complete dental field chest No. 60 and with the aid of a capable dental technician I was given a command tent in which to establish the clinic. At infrequent intervals during the bitter winter we worked in Korean huts but with the onset of the typhus season we were able to make use of our tents. This gave us an enclosed, rainproof working space measuring about 16 by 6 ft. with the usual black-out entrance. A sterilizing table and a cabinet for the packing and storing of large-sized stock bottles were desired. We borrowed an empty medical chest, which opened out into a table with two compartments below for storage. We operated our portable gasoline sterilizer from this chest along with our needle and suture tray containing a 70 percent solution of alcohol and a scrub pan with a solution containing 10 percent acetone 40 percent alcohol 50 percent water and a trace of a proprietary anti-septic. For all operations selected instruments were boiled for 10 minutes while the anesthetic was taking effect. Between patients contaminated instruments were scrubbed in the germicide then boiled again before being wrapped in a clean towel and replaced in the dental chest. Our Korean helper maintained a constant change of halazone-treated hot water from 5-gallon drums for our scrubbing technique. A work bench for the use of the technician was constructed by using a 4-foot plank supported on 2 boxes. The mixing of amalgam cement temporary filling materials and the maintenance of the dental register was performed on this table. Fortunately the motor pool of the company was

supplied with a 3 kw generator. Thus we were able to take full advantage of an available source of current. Borrowing light cord light fixtures and assorted wiring equipment from other units and sections we rigged a droplight over the chair and made connections for the one-third horsepower motor attached to the drill and the included Burton spot lamp. Good amalgam work during the dark winter days was greatly facilitated by the use of the resultant high-speed drill and consequent excellent illumination.

In order to become familiar with the dental health of the command, I held dental sick call each morning and routine operative appointments were conducted in the afternoon. After operating in this manner for 1 month I made an analysis of the sick and wounded report for the month and decided to institute a regimental dental survey as soon as the regiment was ordered into reserve. This decision was based on the fact that: (1) 12 percent of the dental patients seen were held over in the collecting station for extensive treatment resulting from dental defects which were obviously beyond repair; (2) without early diagnosis and treatment each patient on whom an extraction was performed had to be considered a potential evacuee; and (3) routine dental care had to be offered to each regimental unit on an equitable basis compatible with the size of the unit, number and type of cases within the unit, tactical developments and with co-ordination of the transportation, sleeping and feeding problems encountered between the patient and the collecting station.

As the battalions moved into an assembly area, the survey was conducted by the simple expedient of moving into the company bivouac area and checking the men in the food lines rifle inspections, shower groups and similar company or platoon formations. The immediate purpose was to determine the number, type and location of men needing immediate extractions and to establish a record of the number of patients needing treatment. On the basis of this data, it was possible to inaugurate a systematic method of treating the patients needing extractions and partial dentures. After completion of the survey the results were sent through command channels to the various company commanders and certain days of the week were designated for patients requiring dental care to report to the collecting station the tactical situation permitting.

At first it was expected that the frequent reblanketing of the collection station with consequent stripping and reassembling of our equipment would necessarily limit the dental service. The necessity for treating routine dental conditions while the troops were in combat also presented itself. We believed that the treatment of a minor toothache could be postponed under the pressure of tactical developments. In order to compensate for probable limiting factors 2 methods of rendering advanced dental service to the line battalions were devised. Using the available medical technician's first-aid pouch I packed my dental emergency kit, which contained a complete set of extraction instruments, medicaments for treating oral infection, pericoronitis, gingivitis and

moderate forms of periodontal disease along with instruments for incising and draining abscesses. On the march, while in convoys and while our collecting station was being assembled I was able to offer almost any type of emergency treatment from this kit. When the battalions were dug-in or in a more or less static offensive position I was able to take my surgical kit up to the battalion aid stations and hold a dental sick call after first notifying the battalion medical officers to inform the line companies that dental problems could be treated at the aid station. This method of examination and treatment reduced the number of patients who had to be evacuated from the battalion aid stations for dental reasons. It also helped to eliminate those few neurotic dental patients who habitually reported to the collecting station for unnecessary treatment, taking time that should have been devoted to men who were in more acute need of restorations and operative dentistry and who could be more easily and efficiently treated with the aid of the dental unit.

Working in the field with a combat unit I had not only to consider the tooth and associated structures but to become cognizant of other extrinsic factors such as the relationship of the soldier and his unit the relative value of each to his duty and the possible consequences of any extended treatment or evacuation. It was rapidly becoming apparent in this police action that the mental attitude of the average soldier differed from that of participants in World War II.

The incidence of acute oral infection was surprisingly low considering the conditions under which the men had to fight and live. Food to the fighting men often meant soft C rations with drinking water limited to 1/4 canteen per day. Toothbrushes, when available served the more vital purpose of cleaning the trigger housing of the rifles. The resistance of the oral tissues to disease was very low but over a 3-month period the rate of oral infection despite these conditions was negligible. Factors contributing to this included (1) strict indoctrination in oral hygiene (2) individual canteens and (3) the high standards of cleanliness of the field kitchens. The alcohol intake by the individual soldier decreased markedly thus preventing any localized decrease in the pH of the oral tissues. The vitamin C level was augmented by the inclusion of large quantities of fruit juices in the menus. Possibly the most important factor was the use of the antibiotics in the routine treatments of the many specific infections which were treated at the collecting station. A patient admitted for treatment, who might have any type of infection was usually given a course of penicillin which effectively eliminated most pathogens and at the same time probably warded off the onset of an oral infection which might otherwise have occurred.

In this as in any war change is the essence of survival. As a consequence of the recent fluid tactical developments in the Korean campaign orders to strip our supplies to a minimum and increase our

mobility were received. The collecting company was split into a forward and rearward station, with an ambulance run of 25 miles or more between the 2 sections. In compliance with this order our command tent was abolished, our extra equipment was eliminated, and the dental clinic was set up in the quad tent of the aid station at the rear echelon, where I worked directly from chest No. 60 taking from the aid kit and with available medical supplies dental extractions were performed at the forward collecting station in the afternoon. Permanent restorations, and dental work for the service troops near the rearward collecting section were screened on routine sick call in the mornings. There can be no standardized method of performing dental work under combat conditions, but expedients can always be improvised which will aid in increasing the efficiency of the regiment.

### SUMMARY

Following a regimental dental survey a means of inaugurating a systematic method of treating dental conditions in the field was devised and the number of patients evacuated from the combat zone for dental reasons was reduced. This involved (1) the use of an augmented first aid kit, (2) the judicious screening of individual cases and (3) the elimination of patients with neurotic complaints. A surprisingly low rate of oral infection was observed. The management of a dental practice within a fighting regiment presents an interesting and challenging problem.

### BOOK REVIEW

Children Radiographic Technique, by Forrester E. Shurtleff, R. T. Children Medical Center, Boston, Mass. 80 pages; illustrated. Lea & Febiger Philadelphia, Pa. publisher 1951. Price \$3.75.

Although no attempt is made to interpret roentgenograms the essential information for positioning and x-raying the patient is adequately described. The book contains 4 chapters which are brief and yet give all the necessary details concerning (1) equipment and accessories (2) children radiographic positions (3) special radiographic procedures and (4) technique. The illustrations are good. The description of contrast pyelography may be considered by some to be obsolete in that the adult technique does not give such good results in children. In recent years it has been found unnecessary to give enemas or laxatives. By administering a glass of fluid at the beginning of the procedure the stomach is distended so that the kidneys lie behind it and can be well visualized. Careful attention to the technique described in this book will result in more exact diagnoses and conserve film.

—Lt. Col. B. I. Copple MC U S A.

# Adenomatoid Tumor of the Epididymis

Urquhart L. Meeter Major U. S. A. F. (MC) (1)

Jack W. Schwartz, Colonel I MC, U. S. A. (1)

**A**DENOMATOID tumor of the epididymis was first reported by Sakaguchi (2) as an adenomyoma. Several articles reviewing the literature on this subject have since appeared (3,7). The terminology has been confusing and varied, these tumors having been referred to as adenoma, adenomyoma, mesothelioma, adenomatoid, angiomatoid, adeno-fibromyoma, lymphangio-endothelioma, adenocarcinoma, lymphangioma, mixed leiomyoma, and lymphangioma. Although the multiplicity of designations has interfered with an accurate compilation of statistics, about 81 cases have been reported, 64 of these being reported in the past 10 years. It is believed that the incidence of this tumor is not on the increase but rather that the articles mentioned have stimulated interest in benign tumors of the epididymis resulting in increased recognition of the lesion.

There has been much discussion in the literature regarding the probable germ layer of origin. Codiere and Flynn (8) pointed out that the caput major of the epididymis has several ductules derived from the cranial group of mesonephric tubules while the caudal group persists as aberrant ductules and vestigial remnants in the lower portion of the epididymis and they considered these remnants as the possible epithelial

(1) Letterman Army Hospital, San Francisco, Calif.

(2) Sakaguchi Y. Ueber das Adenomyom des N. benedictus. Zentr. Path. 18, 379-387, 1916.

(3) Hixson F. and Gibson T. E. Tumors of epididymis, spermatic cord and testicular tunics. Arch. Surg. 8, 100-137 (pt. 1), Jan. 1924.

(4) Thompson G. J. Tumors of spermatic cord, epididymis and testicular tunics: review of literature and report of 41 additional cases. Surg. Gynec. & Obst. 62: 71, 728, Apr. 1936.

(5) Evans, N. Mesothelioma of epididymis and tunica vaginalis. J. Urol. 50: 249-254, Aug. 1943.

(6) Golden A. and Ash J. E. Adenomatoid tumors of genital tract. Am. J. Path. 21: 63-79, Jan. 1947.

(7) Lee M. J., Jr., Dooley M. B., Thompson G. J., and Vagstad J. M. Benign mesotheliomas (adenomatoid tumors) of genital tract. Surg. Gynec. & Obst. 91: 221-231, Aug. 1950.

(8) Codiere J. T. and Flynn J. E. Adenomatoid tumor of epididymis, report of 3 cases. J. Urol. 56: 448-453, Oct. 1946.

origin. Support is gained from the high incidence of this tumor in the globus minor. The mesothelial theory is stressed by Evans (5), backed by Lee et al. (7), who based their arguments on the proximity of the tumor to the peritoneum plus the finding of serosal communications with the neoplastic spaces in several tumors found in the uterus. The endothelial theory was championed by Morehead (9) and Davenport (10) who believed that coalescence of the vacuolated cells to form spaces mimics the embryologic formation of lymph and vascular spaces. We prefer the term adenomatoid tumor as proposed by Golden and Ash (6). It has the advantage of being morphologically correct but genetically neutral.

Recent reports by Wyatt and Khoo (11) and Burros and Mayock (12) made use of the term adenomatoid. The latter article, in addition, extended the age of incidence to the newborn; the stated age grouping having previously been the third to seventh decades. Glaser (13) stated that an accurate classification is not possible as no one has really had much experience with the tumor. In conclusion, all of these authors believed that the histogenesis has not been definitely established and the possibility of settling the issue seems remote. Any possible clinical significance even if the germ layer of origin were established would appear doubtful.

### CASE REPORTS

*Case 1* A man, 32 years old, was admitted to this hospital in December 1946 with a history of slowly growing nontender mass in the right scrotum of 3 years duration. There was no history of trauma. A right epididymectomy was performed. The lesion was confined to the globus minor. Convalescence was satisfactory and a 4-year follow up showed no evidence of recurrence.

The gross specimen consisted of an irregular mass of tissue 5 cm. in diameter most of which was roughly cylindrical in shape. It was covered by a shaggy gray capsule. The cut surface of this nodule was extremely firm in consistency and white in appearance. The microscopic sections showed masses and strands of dense connective tissue, partially hyalinized in some areas separating glandlike structures. In the periphery of the lesion some smooth muscle elements were present, but none were noted within the tumor proper. The cells comprising the glandlike portion of the tumor varied in shape. In some areas these cells appeared in sheets and cords and in other places their arrange-

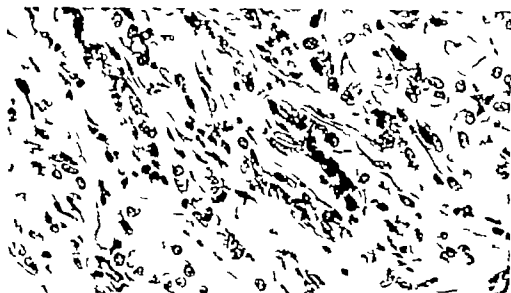
(9) Morehead, R. P.: Angiomatoid formation in genital organs with and without tumor formation. *Arch. Path.* 42: 96-63, July 1946.

(10) Davenport, H., Jr.: Adenomatoid (angiomatoid) formation of genital organs. *Trans. J. Med.* 43: 694-698, Mar. 1948.

(11) Wyatt, J. P., and Khoo, P. S. H.: Genital tract tumours of angiomatoid nature. *B. J. Urol.* 22: 187-194, Sept. 1950.

(12) Burros, H. M., and Mayock, P. P.: Adenomatoid tumor of epididymis; report of case in newborn. *J. Urol.* 63: 712-713, Apr. 1950.

(13) Glaser, S.: Neoplasms of epididymis: review with report of 2 new cases. *Brit. J. Urol.* 22: 178-186, Sept. 1950.

*Figure 1*

ment simulated glands. In the first instance the cells were cuboidal and the cytoplasm was prominent. In the glandlike areas the cells were much flatter and only rarely was a cell with a perinuclear swelling noted. Vacuolization of the cells was a prominent feature. The glandlike areas in general were devoid of any contents except for an occasional desquamated cell lining these spaces. The nuclei were fairly regular in their shape and appearance being roughly oval and moderately vesicular. Several small aggregations of lymphocytes were scattered throughout the tumor area (fig 1). A diagnosis of adenomatoid tumor of the epididymis was made.

*Figure 2*



*Case 2.* A man 60 years old, was admitted to this hospital in October 1949 complaining of a right inguinal hernia of 5 month duration and a painless slowly growing nodule in the right side of the scrotum of 5 years duration. The nodule was firm, measured 2 by 2 cm., and was confined within the globus minor of the epididymis. A right epididymectomy was performed. Convalescence was uncomplicated and a 1 year follow-up showed no evidence of recurrence.

The gross specimen consisted of (1) a firm nodule measuring 2.5 by 2 by 1.7 cm. which was covered by a red gray smooth tunic and to which two irregular sheets of smooth gray-pink tunic were attached and (2) two tubular structures, each about 5 cm. long. Near the termination of one of these tubular structures there was a dilatation forming a nodule measuring 1.3 cm. in its greatest diameter. In the microscopic sections the epididymis was seen along the periphery but the bulk of the specimen consisted of a tumor in which there were many small, irregular spaces. These were lined by a flattened epithelium and occasionally they contained lymphocytes. Small interstitial collections of lymphocytes were also noted (fig. 2). A diagnosis of adenomatoid tumor of the epididymis was made.

#### DISCUSSION

Adenomatoid tumors of the epididymis are benign lesions and are of clinical significance only in the differential diagnosis from other more serious lesions of the scrotal contents. Differentiation from testicular tumors, spermatocele, specific and nonspecific epididymitis, torsion, orchitis, and hydrocele is essential and should not offer too great a problem. Thompson and Davenport stated that about 40 percent of all epididymal lesions are benign tumors and most of these are adenomatoid tumors. Consequently it must be assumed that this condition is much more common than the literature would indicate. Adenomatoid tumors of the epididymis are small, firm, asymptomatic, spherical nodules, occurring most commonly in the globus minor. They occur most often in the third to seventh decades. Trauma is not an etiologic factor. Treatment consists of simple excision or epididymectomy. Radiation therapy is not indicated.

#### SUMMARY

Two cases of adenomatoid tumor of the epididymis are added to about 81 previously reported. The histogenesis of this tumor has not been established. This is a much more common tumor than the literature would indicate and its clinical importance seems to lie only in the necessity of differentiating it from other intrascrotal lesions. The treatment is simple excision or epididymectomy.

# ACTH in the Treatment of Postvaccinal Encephalitis

A SMALL number of cases of postvaccinal encephalitis apparently have been benefited by treatment with ACTH (1). Up to the present time no specific treatment has been available for this condition. Postvaccinal encephalitis is a rare complication of immunization against smallpox and rabies and a similar encephalitis is infrequently seen in convalescence from various viral infections. In 1947 following the vaccination of about 5 million people against smallpox the New York City Department of Health recorded a total of 45 cases of encephalitis with 4 deaths during the 2-month period subsequent to the vaccinations (2). It was not shown that all these cases were postvaccinal encephalitis and, hence, while the maximum possible incidence in this group was 1 per 100 000 vaccinated the actual incidence was probably less. Other estimates of the incidence of postvaccinal encephalitis following smallpox vaccination range from 1 in 640 to 1 in 285 000 in reports from different parts of the world (2). The disease occurs more frequently after rabies immunization and Johnson (3) quoted an incidence of from 1 in 3 000 to 1 in 10 000 vaccinated. The case fatality rate is from 10 to 50 percent (4) but neurologic residues are rare.

Although the cause of postvaccinal encephalitis is obscure certain evidence indicates that the underlying pathologic process is an allergic mechanism. Laboratory studies using experimental animals have indicated that cortisone and ACTH are effective in modifying or preventing the encephalomyelitis which results from the injection of brain tissue emulsions. The lesions of experimental encephalomyelitis are

(1) Personal letter from Dr. Kenneth Thompson to Major General Raymond W. Blithen, Surgeon General, U. S. Army.

(2) Greenberg M., and Appelbaum, E.: Postvaccinal encephalitis: report of 45 cases. New York City Ann. J. M. Sc. 216: 565-570 Nov. 1948.

(3) Johnson H. N. Rabies. In Rivers T. M. (editor): Viral and Rickettsial Infections (Man.) J. B. Lippincott Co., Philadelphia, Pa., 1948, ch. 9 p. 235.

(4) Orlitzky P. K., and Casals J.: Viral encephalitis. In Rivers T. M. (editor): Viral and Rickettsial Infections (Man.) J. B. Lippincott Co., Philadelphia, Pa., 1948, ch. 8, pp. 163-208.

milar to those of postvaccinal encephalitis Moyer et al (5) were able to suppress the central nervous system lesions in guinea pigs by administering ACTH immediately *after* the sensitizing bean-adjuvant mixture was given. Kabat et al (6) prevented the sensitization of monkeys by giving cortisone *before* and immediately *after* vaccination.

Before any conclusion as to the efficacy of treatment with ACTH or cortisone in postvaccinal encephalitis is warranted, further evaluation is indicated. Nevertheless, hope for definitive therapy would seem to be offered in what has previously been a therapeutically barren field.

(5) Moyer, A. W.; Jarvis, G. A.; Black, J.; Koprowski, H.; and Cox, H. R. Action of adrenocorticotrophic hormone (ACTH) in experimental allergic encephalomyelitis of guinea pig. *Proc. Soc. Exper. Biol. & Med.* 75: 587-590, Nov. 1950.

(6) Kabat, E. A.; Volf, A.; and Becker, A. E. Effect of cortisone on experimental acute disseminated encephalomyelitis. *Federation Proc.* 10: 412, Mar. 1951.

## BOOK REVIEW

*Electroencephalography in Clinical Practice* by Robert S. Schwab, M. D., Director of the Brain Wave Laboratory Massachusetts General Hospital, and Associate in Neurology Harvard Medical School. 193 page illustrated. W. B. Saunders Co. Philadelphia Pa., publisher 1951

"The true worth of (the electroencephalogram) to clinical problems lies in the close & correlative effort in obtaining all the facts not only electroencephalographic but also clinical and other laboratory data about each patient and building up the final interpretation from them. The basic value of the procedure is dependent on the amount of aid it can give to the referring clinician in diagnosis leading ultimately to better and earlier treatment. The author in this well-written treatise succeeds in affording the clinician not intimately acquainted with the EEG basis for the use of this technic. The book is not a atlas or a profound treatise on neurophysiology of value only as reference volume but is a practical aid to the busy clinician. A brief historical summary and a short chapter outlining some important basic neurophysiologic theories and data are included. The various degree of normality and abnormality are discussed and chapters describe the EEG in epilepsy in other neurologic and neurosurgical entities and in psychiatry. The chapter on technic and laboratory organization go into some detail on the problems of obtaining and interpreting the records. At the end of each chapter is a short but pertinent bibliography. There is a glossary and an adequate index. This volume should be useful to the internist, neuropsychiatrist and neurosurgeon.

—Lt. Comdr R. G. Berry MC U S N

# A Study of the Unsuitable Person

Maxwell G. Potter *Lieutenant NC, U S N (1)*

THE service psychiatrist's duty frequently involves the culling and eventual separation from the service of men whose personalities make them unsuitable for retention. That these men are detrimental to the service is unquestioned. Their resentment of authority, inability to carry out orders satisfactorily, impulsive actions, and frequent episodes of bizarre behavior tend to be prejudicial to the maintenance of good discipline in the service, to foment unrest in their fellows, and to arouse hostility in their superiors. In addition, their inadaptability and undependability lessens their value, not only in time of emergency, but also in their routine duties. The general ineptness of their performance of duty does not justify the time spent in training them. Much time is lost in the many days these men spend either in a disciplinary status or on the sick list. Furthermore, a small number of such men can reduce the general efficiency of a well-organized, highly mobile tactical unit, such as a ship. These personality problems seem to be lifelong in duration, and it is believed that psychobiographic search would reveal previous evidences of their reacting to situations in much the same fashion as they have reacted to those within the Navy, and that a longitudinal study would reveal previous evidences of socio-psychologic discordance with the environment, as well as interpersonal conflict.

In this article, such a study is reported. No attempt was made to elicit dynamics, but rather to note any common developmental trends and situations. At the time this study was carried out, certain adventitious facets, which would ordinarily complicate the study of service maladjustment, were absent. Many of the patients studied originally entered the Armed Forces via selective service, but all had re-enlisted at the end of their involuntary tour of duty. Hence, they were all in the service by their own choice, and there was no resentment or discontentment at being drafted from a more satisfactory civilian situation. Also, at the time these men were interviewed, there was no thought of the Korean conflict. Indeed, the last man was surveyed from the service 4 days prior to the invasion by the North Koreans.

(1) U. S. Naval Hospital, Portsmouth, V.

1821

The service offers excellent backdrop for the peacetime study of personality conflicts. There is a parental-surrogate relationship with the officers, a pseudo-sibling relationship with the shipmates, and a moderately easy economic situation. This tends to throw interpersonal conflict into bold relief.

A temporal span was selected for study rather than definite number of patients and a 6-month period was thought to be most apt to yield meaningful statistical results without being unwieldy. The 174 patients appearing before a Board of Medical Survey from 1 January to 1 July 1950 were taken for study. They were selected from an admission group for the same period, totaling 504 patients. The established diagnoses are shown in table 1. According to the Joint Armed Forces Statistical Classification and Basic Diagnostic Nomenclature, schizoid personalities and emotional instability reactions are considered evidence of pathologic personality types while all of the other neuropsychiatric diagnoses represent immature personalities. No attempt has been made to treat each personality group individually but rather to handle them as a unit because of the relatively close relationship of all developmental factors.

TABLE 1 *Diagnoses made and tabulated*

Schizoid personality .....	77
Passive dependent reaction .....	64
Passive aggressive reaction ..	11
Emotional instability reaction ..	11
Immaturity with symptomatic habit reactions:	
Enuresis .....	6
Somnambulism .....	3
Speech disorder .....	2
Total .....	174

The hospital stay of the patients studied averaged 33.5 days. Eighty-three percent of the patients fell in the fifth or sixth pay grade, 14 percent in the fourth, and 3 percent in the third pay grade. Twenty patients were Marine 1 in the Army and 1 was a 7 over; the rest were all naval enlisted men. The age distribution of the patients was: 17 to 20 years, 64.9 percent; 21 to 24 years, 24.3 percent; 25 to 28 years, 9.1 percent; and 29 to 34 years, 1.7 percent. The breakdown of time in service showed that 8.2 percent had spent less than 6 months in service; 9.4 percent, 6 to 11 months; 18.9 percent, 12 to 17 months; 16.7 percent, 18 to 23 months; 24.6 percent, 24 to 35 months; 13.1 percent, 36 to 57 months; and 0.1 percent, 5 to 8 years.

In view of the fact that this is a longitudinal study, the information presented from the time of birth through admission to the hospital

*Homes* The essential elements of the early development of the patients are shown in table 2. Of the 62 patients from broken homes the breaks occurred before the patients were 15 years of age in 57 of the 38 patients whose parents were divorced, the divorce occurred before the patient was 10 years of age in 30. Thus familial integrity in these instances was destroyed prior to the time when the patients would begin to feel the moderate security of adolescence. Three of the patients were raised in orphanages.

TABLE 2. *Essential elements of early development*

<i>Type of home</i>	
Broken home	62
Death	(24)
Divorce	(38)
Discordant homes	26
Economically marginal homes	12
Stepparents	32
<i>Position in family</i>	
Oldest	32
Youngest	39
Next to oldest	14
Next to youngest	19
Middle	34
Only	31
Twin	2
Undetermined	3
Total	174
<i>Sibling relationship</i>	
Discordant	27
Envy of others	8
Indifferent	5
<i>Childhood neurotic traits</i>	
Severe	34
Moderately severe	51
Mild	60
None	29
Total	174

*Parents* Forty patients described their mothers as neurotic while another 22 described them as over-protective. Hypochondriacal mothers were reported by 18; 2 were alcoholic; and 5 were adulterous. Thirty fathers, on the other hand, were described as strict; 27 as alcoholic, 11 as rejecting, 11 as disinterested, and 8 as extremely punitive. In addition ambivalence toward the parents was expressed by 24 patients with overt hatred toward the father by 11 and toward the mother by 3. In 42 there was definite evidence of overdependence on the mother. Of the 32 with stepparents 5 expressed hatred for their stepfathers and 2 for their stepmothers. Ambivalent feelings were noted toward 3 stepparents.

Although the average number of siblings in the homes of these patients was 3.3 the average for the patients with schizoid personality

was 4.5. Polarity seemed to be the most common position in the family in that 58.6 percent of the patients were either the oldest, youngest, or only child. The effect of being an only child was noted more often in the passive dependent group and less frequently in the schizoid group; thus it would seem that the schizoid personality tended to develop in the larger family group where the patient was less apt to get attention by being either the oldest or the youngest. This lack of significance in the family group was thought to be a predominant factor.

TABLE 3. School adjustment.

Grade attained (average).....	10.2
Age at which attendance was discontinued .....	16.1
<i>Motivation:</i>	
Poor .....	76
Fair .....	50
Good .....	48
Total .....	174
<i>Relationship to authority:</i>	
Poor .....	44
Fair .....	64
Good .....	66
Total .....	174
<i>Reasons for leaving school</i>	
Graduated .....	54
To work .....	51
No apparent reason .....	40
Failed .....	8
To enter service .....	11
Expelled .....	10
Total .....	174

*Childhood neurotic traits.* It is difficult to assess the full significance of childhood neurotic traits yet the patients were able to give definite evidences of such traits being present. From time to time it was necessary to consider that some traits were more important than others and that 1 predominant severe trait might be more significant in a given patient than 5 or 6 in another. As a general rule however 2 such traits were considered mild, 3 or 4 moderately severe and more than 4 severe. The traits most commonly noted were: anxiety, enuresis, nail-biting, temper tantrums, phobias, sleepwalking, odd behavior, lying, and stealing. Anxiety was the most difficult to assess, dependent as we were on the patient's recollection of the degree of severity of nervousness in his childhood. There were only 12 patients in whom severe physical illness was present in childhood.

*School history.* The school adjustment and reasons for leaving school are shown in table 3. The school background was selected as the first major area in which interpersonal relations and relation to authority other than parents were active. Of the 174 patients studied, only 7 went to college and none of these stayed beyond the first year. It

also of interest that 40 of the patients were unable to state why they left school before they graduated.

*Work record.* Sixty four patients held no job before entering the service. These include the 54 who were enrolled immediately on graduating from high school. Forty-one of the others had a stable work record. There were 15 who held more than one job but performed good work on those jobs. Fifty-four however showed a grossly poor work adjustment. That is to say they were unable to adjust to their employers were unable to carry out their duties satisfactorily and in many instances lost their jobs because of their inadequacy.

*Reasons for joining the service* are shown in table 4. Although the most frequent reason given by these patients was to escape an unpleasant home situation this same reason is implicit in those who wished to travel to see something different to think things over those who wanted experience and those who had nothing else to do. It is probable that those who joined to learn a trade or for educational purposes and who were subsequently frustrated in this aim were overly influenced by recruiting posters.

TABLE 4 *Reasons for enlistment*

To get away from home	50
To see something different or to travel	30
Nothing else to do	20
To learn a trade or for education	16
Unable to find a job	14
To avoid being drafted into the Army	11
To think things over and to get experience	11
No ostensible reason	7
Because friends or brothers joined	6
To escape an unpleasant situation	5
Undetermined	4
Total	174

*Naval adjustment.* Aboard ship 78 of these patients made a good adjustment with their shipmates whereas 96 did not. Of this latter group 79 stated that they avoided their shipmates as much as possible because of disliking their teasing their generally rough conduct, or their too frequent aggressive episodes. Nine stated that their culture differed from that of the other men aboard ship and that their shipmates were too vulgar. Most of this group complained about the use of foul language and unpleasant habits on liberty. 8 complained that they were too close to their shipmates. This latter factor seemed related to latent homosexual trends within the individual man. Only 73 had a satisfactory relationship with their officers. The rest required frequent disciplinary action. It was impossible to evaluate adequately the de-



gree of disciplinary action that each of these men received but at least 60 of them had received 1 captain's mast. Those who had not received some disciplinary action indicated their maladjustment by their rejection of the fashion in which they felt they were being treated by their officers. A large group of them stated that they had no respect for their officers.

TABLE 5 *Presenting symptom on admission*

Anxiety	57
Free-floating	(35)
Headache	(22)
Confusion and odd behavior	12
Hostility gains N. V.	12
Frequent disciplinary action	10
Gradual withdrawal	10
Vertigo	10
Suicidal threat	9
Excessive drinking	7
Syncope	6
Enuresis	6
Insomnia	5
Administrative admission	5
Depression	5
Fear of homosexuality	4
Hyperventilation	3
Excessive masturbation	3
Homesickness	3
Sensitization	3
Speech disorders	2
Somnambulism	2
Total	174

*Sexual background.* Of the patients studied 78 had made a adult heterosexual adjustment. In addition 17 were married and, according to their own statement, happily. Twenty-nine exhibited definite evidence of latent homosexuality. Five had had overt homosexual relationships at one time or another. An additional 45 had made a heterosexual adjustment, but on an immature level and their attitude toward any sexual adjustment was definitely of immature type. The frequency of masturbation among these patients could not be tabulated accurately but in view of the fact that their age span was one in which masturbation might easily be present no significance was attached to it, except in the instances where it seemed to be the predominating cause for admission.

Of the group including those who had showed both heterosexual activity and latent homosexuality promiscuity was noted in 51. This was again difficult to assess because, although masturbation would probably be denied by the majority of these patients promiscuity might be and often was one sphere in which exaggeration (or boasting) took place.

*The cause for admission.* The admission complaints have been listed in table 5. Although 57 of the patients exhibited definite symptoms of anxiety many of the symptoms listed as the cause for admission

sion such as hyperventilation insomnia homesickness seasickness syncope and excessive drinking were as indicative of anxiety as headaches Suicidal attempts confused and bizarre behavior and enuresis indicate more deep-seated conflict than simple anxiety The anxiety of whatever type was thought to be present because these patients could only adjust with total personality reactions and when this defense began to fail as with any other mechanism of ego defense anxiety was released

Although most of our patients were admitted from their own activity 38 were transferred from other hospital services As 16 patients were originally on the orthopedic service it is possible that the majority of them may have been influenced by extensive hospitalization but it is more likely that they were put in a situation where they could be observed more closely by medical officers and as a result their behavior problems were noted Certain of the original causes for admissions to other wards were of a neuropsychiatric nature with somatization

### DISCUSSION

Either neurotic traits or neurogenic factors were at work in most of these patients In no area was this so obvious as in the motivating factors for enlisting The largest number admitted that they were escaping an intolerable home situation A smaller number were looking for excitement adventure or something different Further investigation revealed that many of these men were also escaping or seeking to escape Some waited until they finished school, others could not wait but left at once The situations which were deserted were essentially those of excessive rigidity Hence we cannot be surprised that the symptoms of personality maladjustment did not improve in view of the fact that they were entering a situation little different from the one that they had left as regards rigidity The group with poor work records were attempting to escape their difficulties in the work role but only succeeded in bringing their own maladjustment with them The question of what part the Navy played in worsening the personality pattern of these men arises It has been possible to note a deleterious effect in only 10 percent of the patients seen These men reacted to Navy life in the same way as they had reacted to the former life status—with certain fixed patterns of behavior which were satisfactory for adjustment as long as no tension was produced, or no environmental reactions occurred A large number of these men carried with them into the Navy a rather glamorized vision of Navy life of the "raging foam, and girl in every port" variety This group all reported disenchantment

The ideal approach would be to determine whether or not these men could be identified and isolated at their time of enlistment in the Navy thus saving the cost of training maintaining them in the hospital and then surveying them, which entails the use of doctors corpsmen, nurses and clerical workers The difficulty lies unfortunately in

there being no simple way of ferreting out these personality disorders. Such things as miosis, leprosy, and speech disorders can be found, usually by simple interrogation, provided the man isn't eager to enlist that he will falsify the facts. But if a man's problem consists of acting out certain conflicts, he can only be detected by being in the situation where such behavior is necessary. Psychologic testing can show us that such trends exist, but it cannot tell us that such behavior will ensue. Nor does a history of traumatic episode and immature behavior indicate that such behavior will necessarily follow. As we recognize that there are others with such backgrounds who are socially productive. For such a determination there is no single method. Nonetheless, intensive study at the time of enlistment should be carried out in the hope that the entry of certain number can be blocked.

Once the man has entered the service, early recognition of such personality defect seems to be the best maneuver. It is significant that no less than 32 percent of the patients studied had more than 1 psychiatric admission and 10 percent more than 2. Multiple admissions seem to entail in most instances reduplication of previous study, thus depriving other patients of the medical officers' attention. More intensive therapy at the time of the first admission with an eye toward the patient's better understanding the problem would be preferable to trying to rekindle motivation by exhortation.

A training center where men could perform limited duty with duty more suited to their personalities while undergoing therapy has been suggested, but such a plan would be practical and necessary only during a full mobilization. At present, the best plan seems to be more careful psychiatric scrutiny at the time of induction.

## BOOK REVIEW

*Manual Therapy* by James B. Kennell, M. A., M. D., B. C. (Cantab.), Consulting Physician in Physical Medicine, St. Thomas' Hospital; Vice-President and Hon. Fellow, Chartered Society of Physiotherapy, London, England; Gold Key of the American Congress of Physical Medicine; Gold Key of the American Physical Therapy Association; Honorary Life Member of the Netherlands Physical Therapy Association. 64 pages; illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1951. Price \$2.25.

This practical manual on physical manipulations by a noted British authority on physical therapy discusses various phases of massage movements and joint manipulation. The author points out contradictions and errors as well as benefits of physical therapy. This book is a handy guide to physical therapists, orthopedists, and technicians.

—Col. F. W. Pruitt, MC, U. S. A.

# Aureomycin Therapy for Ambulatory Patients<sup>(1)</sup>

Lester H. Roth *Lieutenant, junior grade DC, U S N R.* (2)

WHEN it is necessary to maintain adequate blood serum and salivary levels of antibiotics in the treatment of oral conditions aureomycin provides a rapid and efficient means of therapy. Oral administration of aureomycin therefore is ideally suited for ambulatory military personnel. Some past disadvantages of antibiotic therapy have been (1) the necessity for parenteral administration (2) insufficient antibacterial spectrum, (3) development of resistant organisms (4) side reactions (5) insufficient factor of safety and (6) need for trained technical personnel.

The available forms of aureomycin provide the dental officer with enough variation in technique (3) to treat a wide variety of dental disorders with comparative ease of manipulation and a minimum of armamentarium. The low incidence of side reactions resulting from the use of these various forms of aureomycin are of particular advantage in the treatment of most cases of oral infection (4). Preoperative medication can be made with ambulatory patients by administering aureomycin in capsule form. A high blood level can be obtained effectively with oral administration. Oral prophylaxis against secondary infection before and after dental extractions can be approached successfully by the administration of troches and irrigating solutions. Although parenteral administration may be used when necessary an effective response is obtained by oral administration.

Among those patients expected to have postoperative complications following dental operations the use of aureomycin has resulted in a marked reduction in the incidence of swelling pain sloughing dis-

(1) From the Research Department of the School of Dentistry University of Pittsburgh. Aureomycin for this study was furnished by the manufacturer.

(2) School of Dentistry University of Pittsburgh, Pittsburgh, Pa.

(3) Roth, L. H.: Table I suggested therapy with aureomycin hydrochloride, crystalline. *Dentistry Pennsylvania Dent. J.* 18: 100-102, Apr. 1951.

(4) Roth, L. H.: Observation and significance of side reaction during treatment of oral condition with oral aureomycin. *West Virginia Dent. J.* 25: 4: 123, Apr. 1951.

TABLE I. *Suggested dose of aureomycin for common oral infections*

Condition	Form	Suggested dose	Average time required for initial relief (hours)
Acute gingivitis	Troche (15 mg.)	15 mg. q. 2 hr for 20 doses	24
Chronic gingivitis	Troche (15 mg.)	15 mg. q. 5 hr. for 15 doses	12-24
Necrotic gingivitis	1% solution	2 cc.	24-48
Vincent's angina	Capoul (250 mg.)	250 mg. q. 5 hr for 16 doses	12
	Troche (15 mg.)	15 mg. q. 2 hr for 16 dose	
Suppurative gingivitis	Capoul (250 mg.)	250 mg. q. 5 hr. for 10 doses	30-36
	1% solution	2 cc.	
Acute suppurative alveoloclasis	1% solution	2 cc. twice daily	24
Periodontal pockets	1% solution	2 cc. **	
	Dental case (5 mg.)	1 per treatment area p. r. n.	24
	3% paste	Applied freely to pocket and press or packed p. r. n.	
Parasitic pulp	0.5% solution	Irrigation of involved area	48-72
Acute periapical abscess	Capoul (250 mg.)	250 mg. q. 5 hr for 8 dose	24
Preoperative prophylaxis	Capoul (250 mg.)	250 mg. q. 6 hr for 8 doses	—
Odontostomy	3% paste	Applied to resultant socket as spherical mass 1/4 inch in diameter	24
Herpes simplex	1% elatment	Applied freely to lesion	48-72
Aphthae stomatilis	Troche (15 mg.)	15 mg. q. 2 hr for 12 doses	24-48
Affections of the tongue	Troche (15 mg.)	15 mg. q. 2 hr for 6 doses	12-36
Affection of the oral mucosa and soft tissues	Capoul (250 mg.)	250 mg. q. 5 hr for 12 doses	24-72
	1% solution as wet dressings	Frequent application to area	—

Applied subgingivally or throughout the mouth when indicated.

Applied well under the detached tissue by means of hypodermic syringe and deposited slowly

agreeable odor delayed healing and other complications (56). Disturbing and painful gingival conditions as well as soft tissue laceration respond promptly to aureomycin treatment. This is of special significance to military personnel as it facilitates treatment while the patient is still engaged in general duty. Areas of chronic or acute suppurative infection of the oral cavity can be treated and brought to a successful termination by irrigation of the tissue flap pocket, or abscess with

(5) Roth, L. H. New York Scot. Dent. J. In press.

(6) Roth, L. H. Aureomycin in overcoming oral odors. West Virginia Dent. J. 25: 98, Jan. 1951.

a prepared solution of aureomycin (5). Routine administration of aureomycin paste applied postoperatively the resultant socket following extraction lowers the incidence of secondary infection postoperative pain, delayed healing and other untoward sequelae (5). Suggested doses are shown in table 1

## BOOK REVIEW

*Practical Clinical Psychiatry* by Edward A. Strecker A. B. A. M. ScD Litt.D. LL.D. M. D. Professor of Psychiatry School of Medicine University of Pennsylvania Franklin G. Ebner, A. B. M. D. Professor of Psychiatry University of Colorado School of Medicine Director Colorado Psychopathic Hospital Jack R. Ewalt, M. D. Professor of Neuro-Psychiatry Administrator of Hospitals University of Texas Medical Branch Galveston Tex Section of Psychopathic Problems of Childhood by Leo Kanner M. D. Associate Professor of Psychiatry Johns Hopkins University School of Medicine 7th edition. 306 pages illustrated. The Blakiston Company Philadelphia Pa. publisher 1951 Price \$7

As the senior author writes in the preface of this latest edition of a text which has enjoyed long popularity among medical students general practitioners and psychiatrists "every physician needs to learn the lessons of psychiatry if he is to be a complete doctor." In line with a growing appreciation of this fact among members of the medical profession as a whole this edition to a greater extent than previous ones places more emphasis on the role nonpsychiatrists can play in understanding and treating the emotional aspects of every patient's illness. To chapter 11 a section has been added on the "somatization reactions" a category of disorders already familiar to most military physicians. In addition an entirely new chapter entitled Support Psychotherapy has been included. Many chapters have been rewritten and improved. In general there is more explicit acknowledgement of the indebtedness of psychiatry and medical psychology to Sigmund Freud and his followers in psychoanalysis. At the same time there has been preserved the best of Adolf Meyer and all the other American and European psychiatrists who have made important contributions to a broader understanding of man in sickness and in health. Some may be surprised that the term Constitutional Psychopathic Inferior is retained as a chapter title when so much that is implicit in the entire book points to that category as a shrinking and increasingly unimportant one. There is a bibliography following each chapter and a general index at the end of the book.—Lt Col. W. J. Barker MC, U S A

## BOOK REVIEW

Proceedings of the Third International Congress of the International Society of Hematology, Cambridge, England, August 21-25, 1950. Editorial Committee: Carl V. Moore, U. S. A.; Edith-in-Chief: L. Berenson, U. S. A.; J. Bernard, France; S. Hahnerman, U. S. A.; J. H. H., U. S. A.; H. Lindner, Switzerland; R. MacFarland, U. K.; S. Mettner, U. S. A.; R. Race, U. K.; E. Sarti, Italy. 393 pages. Illustrated. Grune & Stratton, New York, N. Y. publisher, 1951. Price: Cloth bound \$10; Paper bound \$8.

This volume bound in pyroxylin-impregnated water-repellent cloth, illustrated in black and white only, contains 176 chapters which represent a collection of papers on similar topics written by clinicians, pathologists, clinical pathologists, biochemists, physiologists, immunologists, geneticists, microbiologists and statisticians. It therefore makes the general subject of hematology current for the student, specialists and general practitioners. A complete summary of each article is given in English with the exception of 29 which are either in French or German. There are also occasional exceptions in which only the title is listed or a brief summary of content is made.

The first division consisting of 54 chapters covers the anemia and related subjects adequately. The isolation, properties, pathogenesis, action, and effects of vitamins are well discussed. The subject of hemolytic diseases is well presented. Several chapters are devoted to hypersplenism in the tropics and related experimental studies. The second division consisting of 25 articles on immunohematology thoroughly brings one up to date on the subject of the agglutinins, agglutinoids, antibodies, antiglobulin reactions and the spectrum of all known blood antibodies including the Duffy, Kell-Cellano and the Rh antibodies. The third division consists of 50 articles on leukemia and related diseases, subdivided according to etiology, pathogenesis, histochemical and morphologic studies, clinical considerations and classifications, and therapeutic approaches. The fourth and last division consists of 47 articles on coagulation, purpura and related diseases and miscellaneous subjects. Although many of these contain highly technical information for the specialist alone, there is sufficient variation of content to bring all concerned up to date in trends of research, clinical observations and clinical trials.

This book summarizes present-day trends of thought from all over the world regarding experimental and practical hematology and the material is presented in such a way as to be of interest to teacher, student, clinician, and researcher.—Col. J. M. Blumberg, MC, U. S. A.

# Vasa Praevia

Irving A. Beychok, *Captain, U. S. A. F (MC)*

THE 3 usual causes of bleeding in the third trimester of pregnancy are cervical lesions, abruptio placenta and placenta praevia. Bleeding of the cervix is generally important only in the sense that it must be distinguished from the more dangerous hemorrhages of a prematurely separated placenta or one that is implanted low in the uterus. The following report of a case of vasa praevia is presented to illustrate a fourth cause of late bleeding, the diagnosis and management of which present peculiar difficulties.

## CASE REPORT

A 21 year-old primigravida was admitted to the Ernest Harmon Air Force Base Hospital in the first stage of labor. Her prenatal course had been normal. Her blood pressure on admission was 130/80 and her pulse was 84. The size of the abdomen as well as the menstrual history indicated a term fetus whose head was well engaged in the pelvis. Uterine contractions lasted 45 seconds and occurred at regular 4-minute intervals. About 1 hour after admission following the usual perineal preparation and enema, the nurse noted a moderate amount of fresh bleeding from the vagina, which had not been present on admission. No pain was associated with the bleeding and the uterus was not tender to palpation. The fetal heart tones rapidly deteriorated and for a few minutes were inaudible. The patient's blood was immediately typed and cross-matched and dextrose solution was given intravenously. A rectal examination cautiously performed revealed the vertex to be in the occiput right anterior position at station zero and the cervix to be dilated 4 cm and 75 percent effaced. A bulging amnion was palpated. The condition was diagnosed as a probable mild abruptio placentae. A 500 cc whole blood transfusion and oxygen by mask were administered in an attempt to alleviate the fetal distress. The fetal heart tones improved, a fact which falsely strengthened the diagnosis. Labor was allowed to progress unaided for 3 more hours after which the fetal heart tones again became irregular and faint. At this point a sterile vaginal examination was performed. The amnion was tense and bridged by what was adjudged to be several tough fibrous bands. Inasmuch as dilation of the cervix was still incomplete and had progressed slowly, the membranes were ruptured between these "bands." Labor was greatly facilitated but about 20 minutes later the fetal heart tones disappeared and



were not heard again at any time. In another 20 minutes low forceps delivery under low-spinal anesthesia was accomplished but the infant was stillborn and all attempts at revival failed. Not until the placenta was delivered was the true condition suspected.



Figure 1. Fetal side of placenta. Figure 2. Maternal side of placenta.

### COMMENT

As can be seen in figure 1 and 2 there was a clavicular insertion of the cord. The bands noted on vaginal examination were small arborizations of the umbilical vessels, one of which had ruptured during labor. This condition is known as vasa praevia and is one of the gross placental abnormalities recently reviewed in a paper by Doernerly (1).

(1) Doernerly, G. C. Gross abnormalities of placenta associated with bleeding in pregnancy. *Am J Obst. & Gynec.* 61: 910-913 Apr 1951.

In this condition the bleeding is fetal rather than maternal and blood transfusion is probably of little value. The condition has been mistaken in other instances for placenta praevia (2). DeLee (3) gave the incidence of velamentous insertion as from 0.4 to 1.25 percent and stated that it is 9 times more common in twins than with single fetuses and is almost the rule with triplets. He believed the velamentous insertion to be dangerous only when the vessels in the membranes traverse the lower uterine segment (vasa praevia). The fetus may be lost either because of compression of the velamentous vessels during the passage of the head or as a result of tearing of one or more of the vessels when the membranes rupture.

Among the clues to the diagnosis are (1) a slight but continuous hemorrhage during labor (2) the absence of pain militating against abruptio placentae and (3) rapid weak fetal heart tones especially after rupture of membranes. In some instances the diagnosis may be made before the membranes rupture because the pulsating vessels may be felt coursing over the amnion. When the pregnancy is multiple the condition should be suspected immediately. In the case here reported bleeding occurred before the membranes were artificially ruptured probably as a result of tearing of one of the vessels by the increased pressure attendant on the uterine contractions.

In the treatment of those patients in whom the diagnosis is made before the membranes have been ruptured (as when pulsating vessels are felt in the amnion) the most important point is that every possible precaution must be taken to prevent rupture of the membranes before dilatation of the cervix is complete and the infant can be delivered without delay. To this end a soft elastic colpeurynter may be placed in the vagina and the patient kept in the elevated Sims position. When the cervix is fully dilated the membranes are artificially ruptured between the vessels and delivery effected as rapidly as is consistent with maternal safety.

If the diagnosis is not made until the membranes have ruptured spontaneously it is incumbent on the physician to follow whatever course of action will lead to the most rapid delivery of the infant. Considering the length of time generally required to prepare for and perform a cesarian section, it is doubtful that this would often be the most rapid way to effect delivery.

### CONCLUSIONS

Mild persistent bleeding beginning in labor especially after rupture of membranes and more especially in multiple pregnancies strongly suggests vasa praevia. The cardinal point in treatment is to delay if possible the rupture of the membranes until the cervix is fully effaced and rapid delivery is possible.

(2) V. G. F. H. J. vasa praevia. *Am. J. Obst. & Gynec.* 45: 1044-1046, Jun 1943.

(3) DeLee J. B. and Grenhall J. P. *The Principles and Practice of Obstetrics*. 9th edition W. B. Saunders Co. Philadelphia, Pa., 1947.

## BOOK REVIEW

*An Atlas of Anatomy* by J. C. Bouleau Grant, M. C., M. B., Ch. B., F. R. C. S. (Edin.), Professor of Anatomy in the University of Toronto. By Regions: Upper Limb, Abdomen, Perineum, Pelvis, Lower Limb, Vertebrae, Vertebral Column, Thorax, Head and Neck, Cranial Nerve, and Dermatomes. 3d edition. 637 plates. The Williams and Wilkins Co., Baltimore Md. publishers 1951

Because accumulated knowledge of anatomic structures remains more or less static from year to year the printing of a new edition of an atlas of anatomy may seem redundant. Nevertheless when substantial improvements in pictorial portrayal of anatomic knowledge have been achieved as in this work, a new edition is indeed worthwhile. This atlas was published first in 1943 and a second edition appeared in 1947. The third edition, published in 1951 is more comprehensive revision and embraces several improvements in illustrative technique which enhance clarity. Twenty-eight of the old illustrations have been replaced or improved, and more than 70 new illustrations have been added. Refreshing simplicity has been accomplished by avoiding exhaustive descriptions and by plainly marking and labeling the illustrations serially with large numerals and appropriate titles. The pages are not numbered but each figure is numbered consecutively. An excellent index refers to the figure numbers of the illustrations containing the indexed items.

The atlas is well bound in one large volume with sections on the upper limb, abdomen, perineum and pelvis, lower limb, vertebrae and vertebral column, thorax, head and neck, and cranial nerves and dermatomes. The illustrations are beautifully executed in a manner which portrays the anatomic structures and relationships clearly and accurately. The various components of each illustration are well labeled. Concise but ample descriptions of the illustrated subjects are included. The nomenclature used is the Birmingham Revision of the Basal Nomenclature of Anatomy. Both terms are employed where in some instances the revised and unrevised terms are substantially different. Both terms also are to be found in the index. Throughout the atlas color is used liberally but judiciously to emphasize and differentiate anatomic structures. This volume was prepared with meticulous care, so as to insure accuracy, exclude superfluous matter, achieve clarity and maintain simplicity. It is highly recommended for students of anatomy and should be received with enthusiasm by surgeons.

—Col. J. R. Darnall MC, U S A.

# Self-Administration of Mercaptomerin Sodium

Byron E. Pollock, *Colon I MC, U. S. A.* (1)

James O. Gillespie *Brigadier General, MC, U. S. A.* (1)

**K**REHBIEL and Stewart (2) have recently reported the successful use of a mercurial diuretic mercaptomerin sodium (thiomerin) by patients trained to administer the drug subcutaneously to themselves. Our purpose in this article is to confirm the findings of the above authors and to present our experience with this method in 12 patients treated with mercaptomerin sodium, self administered subcutaneously over periods of from 2 weeks to 8 months.

On 4 October 1950 a patient with hypertensive cardiovascular disease was re-admitted to this hospital in severe congestive heart failure for the third time. Cardiac decompensation had occurred while he was taking adequate maintenance doses of digitalis and was maintaining a satisfactory low-salt diet. During both previous admissions this patient had responded well to the use of mercurial diuretics but had been unable to attend the clinic at frequent intervals for follow-up care after discharge because of economic pressure and the distance from his home to the hospital. He was placed in a bed next to that of a diabetic patient. The thought occurred to us at that time that he could administer mercaptomerin sodium to himself in the same way that the diabetic patient administered his own insulin. On such a regimen his weight fell from 145 to 123 pounds within 1 week after which his weight was maintained by the injection of 1 cc of mercaptomerin sodium every second day. He was discharged from the hospital and seen in the cardiac clinic at intervals of from 1 to 4 weeks. He has since been able to maintain cardiac compensation with no difficulty except for one period in March 1951 when he exhausted his supply of the drug and was without it for 10 days (case 1 table 1).

(1) Letterman Army Hospital, San Francisco, Calif.

(2) Krehbiel, S. and Stewart, H. J.: Self-administration of mercurial diuretic; experience of patients with mercaptomerin (thiomerin) sodium. *J. A. M. A.* 146: 250-253, May 19, 1951.

TABLE 1 Data on 12 patients treated with mercaptopurine sodium by self-administration

Case	Age (years)	IV dose	Date use of mercaptopurine sodium began	Number of injections to Jan 1951	Body weight in pounds		Comments
					Before use of drug	After use of drug	
1	52	Hypertensive cardiovascular disease. Aortic (100) then.	4 October 1950	80	145	123	Cardiac compensation maintained except for 2 periods of extreme hypoxia.
2	60	Rheumatic mitral stenosis	30 October 1950	45	135	175	Cardiac compensation restored and maintained, patient works full time.
3	51	Arteriosclerotic heart disease. Old myocardial infarction.	17 November 1950	15	165	159	Moderate cardiac reserve. Discontinued 5 January 1951. No longer necessary.
4	82	Arteriosclerotic and hypertensive heart disease; bronchopulmonary carcinoma.	8 December 1950	95	146	124	Good cardiac compensation. Several small, mildly endocardial developed as injection sites.
5	75	Arteriosclerotic heart disease. Old myocardial infarction.	15 December 1950	34	146	134	Two recurrences of congestive failure on past discontinuance of regimen. Patient died 3 March 1951 from severe myocardial infarction.
6	53	Malignant hypertension, postmyocardial infarction.	21 December 1950	50	174	175	Change from latrunculos to subcutaneous with satisfactory objective results. Reverted to extremes use 19 April 1951.
7	54	Arteriosclerotic heart disease; old posterior myocardial infarction with anginal syndrome	6 January 1951	131	147	134	Cardiac compensation maintained; angina improved.

TABLE 1. Data on 12 patients treated with mercaptomerin sodium by self-administration—Continued

Case	Age (years)	Diagnosis	Date use of mercaptomerin sodium begun	Number of injections to June 1951	Body weight in pounds		Comments
					Before use of drug	After use of drug	
8	50	Hypertensive and arteriosclerotic heart disease of old arteriosclerotic myocardial infarction.	12 January 1951	20	136	127	Died from new anterior total myocardial infarction on 26 March 1951. Diagnosis confirmed by autopsy.
9	46	Malignant hypertension, postmyocardectomy	24 January 1951	24+	148	140	Compensation maintained. Low cardiac reserve. Patient left hospital area to live in winter. Was still on self-administered mercaptomerin on 15 March 1951.
10	70	Arteriosclerotic and hypertensive heart disease	25 January 1951	10	116	106	Emotionally unable to inject self often enough. Un dependable maintenance of weight chart and appointments. Method discontinued.
11	64	Arteriosclerotic heart disease Old myocardial infarction.	6 February 1951	57	207	198	Compensation maintained. No reactions.
12	36	Chronic mitral stenosis post-commissurotomy	10 April 1951	4	107	100	Patient left hospital 24 April 1951 to live in another city.

A program for the use of self-administered mercaptomerin sodium (3) dating from the time of the above-mentioned patient was planned on clinical basis. Whenever a patient presented himself either in the hospital or in the cardiac clinic in need of long-term mercurial diuretic medication he was added to the study. Subcutaneous injections of mercaptomerin sodium were given by a physician the first 2 times and on the third occasion by the patient in the presence of the physician. With this background of training patients were able to continue their own medication without difficulty. The anterior surface of the thigh was chosen as the most readily available site for injection. The usual dose employed was 1 cc. Patients were instructed to maintain a daily record of body weight. The time interval between injections was specified by the physician at the time of the clinic visit and adjusted from time to time indicated by the patient's weight chart. Although some patients required daily injections for short periods, the average interval was every other day to twice a week.

## RESULTS

Mercaptomerin sodium has been self-administered by 12 patients with chronic heart disease. The data are summarized in table 1. Excellent results in maintenance of cardiac compensation were obtained in 10 patients. One patient (case 12), was not under observation long enough to evaluate the method and in another (case 10) the attempt to use this method of administration had to be abandoned because of poor cooperation of the patient. Four illustrative cases are reported below.

## CASE REPORTS

**Case 2.** A 60-year-old man with hypertensive cardiovascular disease and marked mitral stenosis had been placed on digitalis therapy in 1939 because of congestive heart failure. Auricular fibrillation had been present for many years. He entered the hospital on 23 May 1950 for the fifth time in congestive heart failure. Compensation was restored by the addition of a low-salt diet and daily injections of mercurial diuretic. He was discharged to clinic care on 12 June 1950, but was unable to maintain complete cardiac compensation through occasional intravenous injections of mercurial diuretics and the daily use of oral mercurial diuretic tablets. On 10 October 1950 he was placed on the program of self-administration of mercaptomerin sodium. Since that time he has been able to maintain compensation while working for from 8 to 12 hours a day. He has felt well enough to undertake additional work responsibilities and has married. Examination in May 1951 revealed no evidence of cardiac decompensation.

**Case 3.** A 49-year-old soldier was admitted to this hospital on 14 May 1949 with history of anterior myocardial infarction in December

(3) Initial supplies of Thiomerin (mercaptomerin sodium) were provided by the manufacturer.

1937 with recurrent congestive heart failure on 2 occasions following return to limited duty despite the use of digitalis and a low-salt diet. On admission there was marked anasarca. The signs of severe congestive heart failure and of tricuspid insufficiency were present. The ECG revealed right ventricular hypertrophy. The use of a low-salt diet and administration of digitalis and mercurial diuretic drugs to the maximum amount tolerated clinically led to recompensation and loss of tricuspid insufficiency and the patient was retired from the Army. On 17 November a schedule of intravenous injections of a mercurial diuretic was superseded by the program of self-administration of mercaptomerin sodium. The patient's weight was reduced during the first week from 165 to 160 pounds and thereafter was maintained at a relatively constant level by the administration of the drug. This patient required an injection twice weekly during the first 2 weeks and thereafter he was able to extend the interval between injections gradually so that 1 month later he was taking only 1 injection per week. On 5 January 1951 he took his last injection of a mercurial diuretic in view of the fact that no weight increase developed thereafter and he manifested no evidence of congestive heart failure. He continued to take maintenance doses of digitalis and to use a low-salt diet. In February 1951, he began working full time as a guard at an industrial plant and has continued to do so with excellent cardiac compensation and satisfactory cardiac reserve.

*Case 5* A 75-year-old man with arteriosclerotic cardiovascular disease was released from this hospital in February 1950 following myocardial infarction with congestive heart failure. Maintenance doses of digitalis, a low-salt diet and the use of oral mercurial diuretic tablets proved inadequate to maintain cardiac compensation so that parenteral injections of mercurial diuretics were initiated on 13 April 1950. On 15 December because of inadequate control of congestive failure with weekly injections of intravenous mercurials at the cardiac clinic he was placed on self-administered mercaptomerin sodium given every second day. In the following week he lost 10 pounds, the edema of the ankles decreased from 3 plus to 1 plus, indigestion and shortness of breath were relieved and his mental alertness improved. He gained and maintained good cardiac compensation. During rehospitalization of the patient in February 1951 because of influenza, he maintained compensation without diuretic medication. After discharge however the signs of congestive heart failure reappeared and were again controlled by self-administered mercaptomerin sodium. He died on 3 March from a new myocardial infarction.

*Case 11* A 64-year-old man began to have attacks of angina pectoris in 1947. In 1949 auricular fibrillation developed and was controlled by digitalization. Following a period of excessive use of alcohol he was admitted to this hospital on 10 September 1950 in congestive heart failure. Cardiac compensation was restored through the use of



a low-salt diet, vitamin supplement, and digitalis. Auricular fibrillation converted spontaneously to normal rhythm. On discharge from the hospital he was followed in the cardiac clinic and maintained compensation well until 6 February 1951 at which time he was again found to be in congestive heart failure. A brief period of hospitalization again restored cardiac compensation and he was discharged on the program of self administration of mercaptopotassium sodium on 16 February. He has been able to maintain a relatively constant weight with an average of 3 injections of the drug per week and the use of a low-salt diet and was well compensated in May 1951. He has had no untoward symptoms since the introduction of mercaptopotassium therapy except for 1 brief period of anorexia attributable to overdosage of digitalis.

The salt depletion syndrome (4) was not encountered in any of these patients either by clinical manifestations or laboratory findings. Local reactions to subcutaneous injections occurred in only 1 patient (case 4) and consisted of small nodular formations at the site of injections which persisted for several weeks. The nodules were mildly tender for only the first few days. This reaction was not severe enough to deter the patient from continuing the method. Local infection at the site of injection was not encountered.

#### DISCUSSION

Mercaptopotassium sodium, now a standard item of supply, has been shown to be a safe and effective diuretic when administered subcutaneously (2, 3-7). This characteristic renders it suitable for self injection by patients with chronic heart disease who require mercurial diuretic in addition to the other drugs and supportive measures in common use for maintenance of cardiac compensation. Through supervision the physician should assure himself that the patient has mastered the technique of self injection. Clinic visits at weekly to monthly intervals should be scheduled on an individual basis with more frequent visits early in the program. If a patient is initially placed on self administration of mercaptopotassium sodium while in the hospital, the cardiac compensation once secured can be well maintained provided cooperation of the patient continues after his discharge. Initial studies of end function in relation to the patient to report the development of weight and periodic checks of the serum sodium level should suffice to prevent low-salt reaction (7).

The two deaths occurring in this series were caused by new infection of the myocardium in patients with severe coronary arteriosclerosis.

(4) Brander, H. A. P. and F. H. Re. Nodules at the site of intramuscular injections in low-salt syndrome. *J. A. M. A.* 141: 117-124, Sept. 10, 1949.

(5) Hermann, C. P. Myocardial insufficiency, mechanism and management. In *Self Administration of Mercurial Diuretic*. *J. A. M. A.* 140: 507-513, June 11, 1950.

(6) Hermann, C. P. et al. Patients with chloroquine poisoning treated with mercurial diuretic. *Clinical Chem.* 1: 506-513, Apr. 1950.

rosis who had been maintained in cardiac compensation. Such deaths are reasonably attributable to the natural course of the disease and are not chargeable to therapy with a diuretic drug.

The self-administration of mercaptomerin sodium relieves the patient of the necessity for frequent clinic visits and enables him to maintain an even state of compensation without frequent accumulations of fluid followed by excessive diureses. This method also reduces the demands on the time of the clinic personnel.

### SUMMARY

Twelve patients have given themselves injections of mercaptomerin sodium over a period varying from 2 weeks to 8 months. These patients were suffering from chronic arteriosclerotic hypertensive or rheumatic heart disease and required the use of a mercurial diuretic to maintain adequate cardiac compensation. Data regarding these patients is tabulated and more detailed accounts of 5 of them are given. Self-administration of the drug was acceptable to 11 of them, and safely maintained cardiac compensation. Reactions to the medication occurred in 1 patient and were limited to local nodule formation. This program benefited the patients by reducing the number of clinic visits required and by maintaining level cardiac compensation. Fewer visits by these patients likewise relieved the clinic personnel of routine work. These results confirm the recent report of Krehbiel and Stewart (2) and suggest the desirability of widespread adoption of this method of treatment.

### BOOK REVIEW

*Clinical Pediatric Urology* by Meredith Campbell, M. S., M. D., F. A. C. S., Professor of Urology, New York University Post-Graduate Medical School; Visiting Urologist, Bellevue and University Hospitals, New York, With Section on Nephritis and Allied Disease in Infancy and Childhood, by Elvira Goettsch, A. B., M. D., Associate Professor of Pediatrics, University of Southern California School of Medicine, and Assistant Medical Director of The Children's Hospital Society of Los Angeles; and John D. Lytle, A. B., M. D., Late Professor of Pediatrics, University of Southern California School of Medicine; and Medical Director of The Children's Hospital Society of Los Angeles. 1113 pages, illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1951.

The author of this long-needed text is one of the world's leading authorities on urology in infants and children. His 30 odd years of experience with the urologic problems of childhood, in one of the world's largest metropolitan areas and his close associations with pathologists, pediatricians, and other clinicians in that area has given him a rich background from which he has drawn the material for this volume. As he reminds us much of the advancement in handling urologic problems

in infants and children comes from the revelation of an unsuspected high incidence of urinary anomalies by xcretory urography. Furthermore, continued perfection of miniature urologic instruments for diagnosis and treatment of urologic conditions in infants and children exactly as in adults has hastened this advancement.

This book covers all of the problems likely to be encountered in the handling of urogenital disease in infants and children. A section on nephritis and allied disease in infancy and childhood written by two leading pediatric professors as well as a chapter on pediatric urologic nursing is included. The order and presentation of subject matter varies little from that of most urologic texts but abundant space has been given to conditions most prevalent in the early years of life such as anomalies of the urogenital tract and such complications as urinary infections and tumor. So much space has been given to these conditions such as prostatic diseases not frequently encountered in children. Likewise the large section on operative procedures highlights the commonest procedure required in urologic operations in children.

Methods of examination and diagnosis in infants and children differ from those in adults. Though identical etiologic agents and pathologic conditions are present in each, the manifestations differ in children. The difference is adequately emphasized throughout the book.

The section on embryology and anomalies is invaluable. It is comprehensive yet concise. The reader is never allowed to lose sight of the clinical aspect of these anomalies and how likely they are to be responsible for urinary tract obstruction and infection. A large section is devoted to urinary infections, tuberculosis and otherwise. Here again the difference from these conditions in adults lies not in the etiology and pathology but in the manifestations, differential diagnostic methods and modes of administration of therapeutic agents. Modern concepts in regard to renal calculi are discussed. In the section on the male genital tract and the female urethra, infections, endocrine problems and conditions requiring corrective operations are thoroughly covered.

One of the best discussions of kidney tumors available is found in the section on tumor. Likewise the chapter on the adrenal glands with the latest concepts of the clinical significance of the steroids is well worth study. For the most part the illustrations are excellent. This volume is extremely valuable as a text primarily for urologists but should be of interest to pediatricians as well.

—Col. R. T. Arman, MC U. S. A.

# The Surgical Importance of Schoenlein-Henoch Disease<sup>(1)</sup>

Edward T. Gordon, *Captain, MC U S A*

**T**HE LITERATURE is replete with description of Schoenlein-Henoch disease. The syndrome is usually easily recognized and — diagnosed. Its relationship to allergy is widely accepted (2). The diagnostic triad consists of a characteristic exanthem which is not necessarily purpuric, gastrointestinal symptoms, and joint manifestations. In the absence of cutaneous manifestations the visceral involvement at times offers a perplexing diagnostic problem. These symptoms and signs often suggest an acute surgical condition of the abdomen. That this condition is not rare is apparent from our experience at this hospital. Two cases were observed in 1 year among 2,539 hospital admissions. They illustrate the difficulty of diagnosis when the cutaneous signs are absent.

## CASE REPORTS

**Case 1** A soldier was admitted to the surgical service of this hospital on 5 April 1950 complaining of abdominal pain and a skin rash. He had been well until 2 April when he noticed a generalized pruritic rash. He was treated with benadryl and in 24 hours the pruritus was markedly improved. On the morning of admission he was awakened by dull colicky periumbilical pain associated with anorexia and nausea. An hour later the pain disappeared spontaneously but a residual soreness remained. No history of previous episodes of abdominal pain, allergy or serious illnesses was obtained.

Physical examination revealed a temperature of 99.4° F, a pulse of 84, and a respiratory rate of 22. A generalized urticaria, most marked on the flexor surfaces of the extremities, was present. There was guarding in the right lower quadrant of the abdomen but no spasm or rigidity. Rebound tenderness was present throughout the abdomen. The peristaltic sounds were normal. Rectal examination elicited tenderness on

(1) 7th Station Hospital, Trieste.

(2) Hampton, S. F.: Henoch purpura based on a food allergy report of 2 cases. *J Allergy* 12: 579-591, Sept. 1941.

the right side. The leukocyte counts ranged from 10 250 on the day of admission to 7 700 with normal differential counts in the course of the next 5 days.

The patient was given 50 mg. of benadryl q. i. d. with almost complete disappearance of the rash by 10 April the day of discharge. Twenty-four hours later he was readmitted with soreness in both knees and the right ankle and blue blotches over his legs.

Physical examination on this admission revealed purpuric lesions scattered over the lower extremities. On the right buttock an erythematous papular eruption was present which was pruritic. Hydrathroels of the left knee and tenderness about the patella were present. Tenderness was elicited on palpation of the lateral aspect of the right ankle. Laboratory tests including blood counts, bleeding and clotting times, platelet counts and sedimentation rate were all within normal limits. The cuff test was negative. The microscopic examination of one urine specimen showed an occasional red blood cell. The stool was negative for occult blood. The ECG was normal. Symptomatic therapy was instituted and by the fifth hospital day the joint symptoms and the purpura had subsided.

*Comment.* The presence of cutaneous manifestations with gastrointestinal symptoms offered no diagnostic problem. The response to antihistaminic drug was prompt but did not prevent progression of the disease.

*Case 2.* A 21-year-old male was admitted to the medical service on 12 January 1951 complaining of crampy lower abdominal pain of 4-day duration. He stated the illness had begun on 8 January when he experienced lower abdominal colic associated with constipation. A laxative administered afforded no relief. Two days before admission, anorexia, nausea, and vomiting developed. A complete blood count and urinalysis on 9 January were within normal limits. One day before admission a cathartic produced some relief of his symptoms. On the day of admission the abdominal pain reappeared after he drank some liquid. The patient described his pain as continuous colicky and severe enough to cause him to writhe in agony. It was in the midline below the umbilicus and was associated with nausea, vomiting, and the passage of flatus. The patient had had an appendectomy in 1946 for pain of a similar nature. During the second postoperative week he had had recurrence of the pain and had been advised that it was probably gas pain. After about a month this disappeared. His mother had had hay fever.

Physical examination revealed a well-developed young man in acute distress. No physical findings in the abdomen were present to account for the severe pain. The leukocyte count was 8 850 with a normal differential count. The diagnosis entertained on admission were obstruction of the small bowel, intussusception, and gastroenteritis.

The abdominal pain persisted and was controlled only with large doses of meperidine hydrochloride. Parenteral fluids were given. On the second hospital day 200 cc of bright red blood was passed by rectum. At this time he vomited green blood flecked material. The abdominal findings remained negative; the temperature remained normal and urinalysis revealed an occasional red blood cell and from 2 to 3 leukocytes per low power field. The leukocyte count had risen to 11,650 with 54 percent polymorphonuclear cells, 36 percent lymphocytes, 4 percent monocytes, and 6 percent eosinophils. A flat x-ray plate of the abdomen showed no abnormalities. An intravenous pyelogram was normal. The continuous severe abdominal colic associated with melena, a normal temperature and absent physical findings was a diagnostic challenge. On 16 January the white blood cell counts were elevated to 16,100 with 63 percent neutrophils, 26 percent lymphocytes, 2 percent monocytes, and 9 percent eosinophils. The sedimentation rate was 7. The hemoglobin was 14 gm. and the hematocrit was 48. A gastrointestinal series showed a hyperknetic stomach and spasm of the small intestine. A tourniquet test proved normal. A therapeutic test for allergy with 0.5 cc. of a 1:1,000 solution of epinephrine was performed with negative results. During the same day the abdominal pain became excruciating and was not controlled with meperidine hydrochloride. The patient passed another large bloody stool. Definite rigidity, spasm, and tenderness in the left lower abdominal quadrant near the midline and generalized rebound tenderness had developed. Peristaltic sounds were present but diminished. The white blood cell count was 16,500 with 82 percent polymorphonuclear cells, 14 percent lymphocytes, 1 percent monocytes, and 3 percent eosinophils. An exploratory laparotomy was advised. The preoperative diagnoses in order of probability were inflammation of Meckel's diverticulum, intussusception, an abdominal vascular accident, and intestinal ulceration.

Under spinal anesthesia a right paramedian incision was made in the midabdomen. On opening the peritoneum about 500 cc of straw colored fluid were found. A specimen was taken for culture. The diagnosis became obvious when the loops of small intestine were visualized. The entire small bowel and mesentery appeared edematous. On the subserosal surface of the entire small intestine were hemorrhagic lesions from 1 to 3 cm. in diameter, most marked at the terminal ileum. The vessels of the small intestine were markedly injected. The stomach and colon showed no hemorrhagic lesions. The spleen was not enlarged and no other abnormal findings were noted. The abdomen was closed.

Laboratory tests were obtained postoperatively in order to determine the type of bleeding diathesis. A bleeding time, a clotting time, a prothrombin time, a platelet count, a clot retraction, and a tourniquet test for capillary fragility were all normal and a diagnosis of nonthrombopenic purpura was made.

The patient did not improve and he required large doses of analgesic daily. He was given intravenous feedings containing 1 gm. of ascorbic acid, 4 mg. of vitamin K, and small blood transfusions daily. For the allergic origin of the disease he was given 50 mg. of benadryl q. i. d. and 0.5 cc. of a 1:1,000 solution of epinephrine in oil b. i. d. No dramatic effect resulted from this treatment. On 19 January for the first

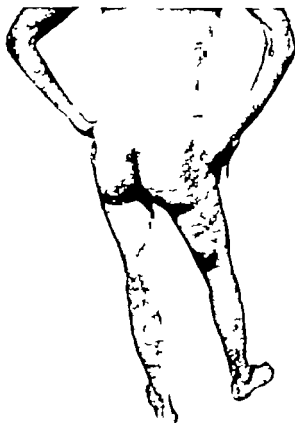


Figure 1 (case 2). Photograph showing the confluence of the lesions around the elbows and other joints.

time a purpuric rash developed which was most prominent on the dependent body surfaces and extensor surfaces of the extremities (fig. 1). This rash was papulonodular and did not blanch on pressure. By 22 January the lesions had almost completely disappeared but the patient continued to pass large tarry stools. On 24 January generalized, erythematous maculopapular rash and gross hematuria appeared.

The rash had all the characteristics of erythema multiforme. On 27 January the fifteenth hospital day the patient was transferred to the 98th General Hospital where on 31 January treatment with 100 mg. of

cortisone tid was started. Three days later his symptoms were improved and the skin lesions had faded. On 4 February the cortisone was decreased to 200 mg a day but he began to develop new skin lesions. A bone marrow biopsy specimen obtained on 6 February was normal with mild reticuloendotheliosis. The course of cortisone was terminated on 16 February. At that time the patient showed evidence of nephritic involvement with hematuria and albuminuria. He was allowed an ambulatory convalescence which was interrupted by the reappearance of the cutaneous manifestations and a persistence of the hematuria and albuminuria.

*Comment.* This patient presented a perplexing diagnostic problem. The association of melena and severe abdominal pain in the presence of a normal temperature suggested an acute surgical condition within the abdomen. The use of the tourniquet test for diagnosis and the therapeutic test with epinephrine were of no aid. A laparotomy under such circumstances is justifiable. Cortisone appears to have definite value in the treatment of this condition.

## DISCUSSION

Many observers have reported cases of Schoenlein-Henoch disease without cutaneous manifestations (3-8). Edema of the small intestine with characteristic hemorrhagic lesions particularly of the terminal ileum is usually found at operation. The possible complications of such lesions include obstruction, intussusception and gangrene with perforation. Involvement of the entire small intestine, stomach, cecum, and ascending colon have also been reported. Several diagnostic procedures have been recommended. Barnes and Duncan (8) recommended (1) testing capillary permeability by means of a tourniquet, (2) examining the skin for dermatographia and (3) observing the therapeutic effect of epinephrine given intramuscularly. Of these procedures the tourniquet test is frequently negative and the therapeutic test with epinephrine is of no value because of the hemorrhagic condition of the intestinal wall but the presence of dermatographia is of value. Gairdner (2) stated that on firmly stroking the skin of a patient's arm with a blunt rod the wheal produced soon completely fades and the next day is replaced by a bright

(3) Bailey H.: Purpura acut. abdominal emergency. *Brit. J. Surg.* 18: 234-240, Oct. 1950.

(4) Tidball L. R.: Erythema group of skin diseases with especial reference to abdominal pain. *J. A. M. A.* 96: 2010-2014, Jan. 13, 1931.

(5) Sturtevant, M., and Graef, L.: Henoch-Schönlein purpura with paralytic ileus and thrombosis of cardiac. *M. Clin. North America* 17: 91-104, July 1933.

(6) Althausen, T. L.; Deamer, W. C.; and Kerr, W. J.: False acute abdomen; Henoch's purpura and abdominal allergy. *Ann. Surg.* 106: 242-251, Aug. 1937.

(7) Schwartzman, J.: Henoch's purpura with intussusception. *Arch. Pediat.* 57: 389-394, June 1940.

(8) Barnes, C. G., and Duncan, G. W.: Anaphylactoid purpura simulating acute regional ileitis. *Brit. J. Surg.* 29: 253-255, Oct. 1941.

(9) Gairdner, D.: Schönlein-Henoch syndrome (anaphylactoid purpura). *Quart. J. Med.* 17: 93-122, Apr. 1948.



red line which subsequently fade and becomes brown. In the same way the skin creases beneath sphygmomanometer cuff become outlined in from 12 to 24 hours after a blood pressure reading. Any intradermal injection produces a delayed reaction which is likely to cause false positive reading of a Mantoux or other intradermal test. The chief disadvantage of this test is the delay of from 12 to 24 hours required to determine the result.

Although Schoenlein-Henoch disease may simulate an acute condition within the abdomen laparotomy in this condition is not to be condemned because of the possibility of surgical complications (9). At times the only means of diagnosis will be by surgical intervention.

## BOOK REVIEW

*Diagnostic Methods in Veterinary Medicine*, by Geo. F. Boddie B. Sc. (Edin.), M. R. C. V. S., F. R. S. E., Professor of Medicine Royal (Dick) Veterinary College Edinburgh with chapters on Clinical Haematology by H. H. Holmes, D. Sc. Ph. D., M. R. C. V. S., Pathologist, Agricultural Research Council Field Station, Compton, Berkshire and Chapter on Diagnosis of Poultry Diseases, by J. G. Campbell, F. R. C. V. S., Department of Poultry Disease Royal (Dick) Veterinary College Edinburgh. 389 pages illustrated J. B. Lippincott Company Philadelphia Pa., publisher 1951 Price \$5.

This third edition of Boddie's text contains relatively few changes from the preceding edition. The chapter on Allergic reactions has been expanded to include the latest information on tuberculin testing and the chapter dealing with urinalysis in the older edition has been enlarged and now includes general information on clinical biochemistry. Following an introduction there are chapters on general examination, digestive system and abdomen, respiratory system, circulatory system, urinary system nervous system, skin, lymphatic system, sense organs genitalia and mammae locomotor system, allergic reactions. Lectures of material for laboratory examination, clinical biochemistry clinical bacteriology clinical helminthology clinical haematology post-mortem technique and diagnosis of poultry diseases. The book is well written, covers the subject completely and lends itself to quick reference. It is a valuable addition to the veterinarian's library.

—Lt. Col. R. H. Willers VC, U. S. A.

# Echinococcus Cysts of the Liver With a Report of Two Cases<sup>(1)</sup>

Luther G. Bell *Captain, MC, U. S. N.*

Joseph L. Yon, *Commander MC, U. S. N.*

David J. Williams, Jr., *Lieutenant Commander MC U. S. N.*

THE *Echinococcus granulosus* or dog tapeworm, is a small parasite not more than 6 mm. in length (2). It consists of a head and neck (scolex) which has 4 suckers and is encircled by a double row of hooklets (about 30 in all), and somatic segments. The adult worm is found in the intestines of dogs, wolves and other carnivores. The most distal of the worm's 3 segments is the ripe gravid segment which contains from 500 to 800 ova. Following maturation of these ova the whole segment or the extruded ova are passed in the feces of the host animal. The ova are then consumed by one of the intermediate hosts such as cattle, sheep, hogs or man, in contaminated food or water. The ovum passes through the mucosa of the intestine of the intermediate host into the blood stream and thence to various parts of the body. The dog or wolf eats the infected tissue of the intermediate host, and the life cycle is started over with maturation of the larvae to adult tapeworms.

The ovum on lodging in the liver or one of the other organs begins to grow usually very slowly and forms a cyst. These cysts are of two types: the unilocular and, a much less common type, the alveolar. The typical unilocular cyst consists of an outer layer which is thick, laminated and elastic and is surrounded by a marked fibrotic tissue reaction of the host and an inner layer which is the nucleated germinal layer. Numerous small infoldings or papillae form from this inner layer and eventually break off into the cystic fluid as single-layer vesicles known as brood capsules. By the budding of these vesicles, scolexes or matured larvae develop and are ready to start a new life cycle. Sometimes instead of the immediate development of brood capsules, daughter

(1) U. S. Naval Hospital, Philadelphia, Pa.

(2) Strong, R. P.: *Starr's Diagnosis, Prevention and Treatment of Tropical Diseases*, 6th edition, The Plakison Co., Philadelphia, Pa., 1942, pp. 1474-1475.

or even granddaughter cysts in y form which are in ll respects similar to but smaller than the mother cyst. The alveolar cyst undergoes essentially the same maturation process but the germinal layer breaks through the outer laminated layer forming multiple daughter cysts outside the mother cyst and preading to form a more diffuse mass resembling a lignant growth. Whether this is a different species or is the result of partial limitation is still undetermined.

The diagnosis of echinococcus cysts of the liver is notoriously difficult, especially in the United States where because of the relatively low incidence of the disease it is not always borne in mind. These cysts may simulate those of the liver cholecystitis abscess or primary and secondary neoplasms of the liver. It is estimated that 25 percent of human beings infested with the echinococcus go through life without any symptoms. A review of the literature by Magath revealed that less than 500 cases had been reported in this country up to 1939 and, of these less than 5 percent were native of the United States or Canada. The liver is the most common site for these cysts being the primary location in about 65 percent of patients and of these the right lobe is involved 85 percent of the time (3). The lung is the next in frequency of involvement, being the site in about 24 percent. Cysts have been found in striated muscle bones (including the spine), kidney, spleen, brain, heart, thyroid, breasts, parotid, prostate and pancreas (4).

Cysts of the liver may continue to grow for many years (5) or throughout a person's life without producing any signs except enlargement of the liver and some accompanying vague subjective complaints such as sensation of fullness or of weight in the epigastrium. More rarely nausea, vomiting, respiratory distress and even cardiac embarrassment may occur. In a report of 40 patients from the Mayo Clinic (5), 14 had a history of severe biliary colic and 11 but none of these had been indicated. 10 gave a history of mild or indefinite pain in the right upper abdominal quadrant, 16 had no complaint referable to the biliary tract. Poore and his associates (5) reported that jaundice occurs usually not as a result of compression of the bile ducts directly but by embolic obstruction of the ducts by daughter cysts a portion of the cyst wall or other debris following rupture of the mother cyst. A cyst may suppurate and produce liver abscess. It may rupture into large bile duct or into the peritoneal cavity. If it ruptures into the peritoneal cavity sudden fatal anaphylactic shock may result. If the patient survives, multiple implants and secondary cysts may occur.

(3) Barnett, L. Progress in our knowledge of hydatid disease, with some counter-buzz theories from Otago Medical School New Zealand M. J. 44: 304-308, Dec. 1945.

(4) Cole, G. A. The Australasian Hydatid Register, The Health Bull. Melbourne Nos. 83/84: 225-226, July-Dec. 1945.

(5) Poore, T. N. Mearns, C. P.; and Walters, W. Echinococcal cysts: bacteriological and clinical aspects of case. Arch. Surg. 59: 1001-1006, Nov. 1949.

The diagnosis of this condition is suggested when a mass is felt in the upper abdomen associated with vague gastrointestinal or biliary tract symptoms in a patient otherwise not seriously ill. A deformity of the diaphragm or a calcified cyst wall in the liver seen on roentgenographic examination is suggestive. The echinococcus cyst is the most common cause of calcification within the liver (6), but it must be differentiated from calcified abscess either pyogenic or amebic and calcified hemangioma. Diagnostic puncture is dangerous because it may result in spread to the peritoneal cavity or fatal anaphylactic shock, and even if uncomplicated may not reveal the diagnostic hooklets or scolexes. Significant eosinophilia is present in 25 percent of the patients (7). Fortunately specific tests for this infestation are available (8). The first and easiest is the Casoni skin test. This is an intradermal test using 0.25 cc of filtered hydatid fluid. The reaction may be immediate or delayed. In a typical immediate reaction, the wheal increases in size and develops pseudopodial outrunners. It reaches its maximum size in from 10 to 20 minutes and is negative if less than a 20 mm. reaction occurs. Early false positives may be seen in patients with other allergic manifestations or other parasitic infestations especially with *Taenia saginata* and *Taenia solium*. If a patient has none of these diseases an early positive reaction is diagnostic of hydatid disease in 75 percent of patients. Absence of a positive immediate reaction is indicative of no echinococcus infestation in at least 95 percent of patients. This immediate reaction is only of value before the first operation because a positive reaction may persist for years after surgical removal of a cyst with no further infestation. A delayed reaction is the development of an area of erythema with subjacent induration that subsides in from 12 to 24 hours. This may be an intense reaction. This delayed reaction if positive is diagnostic of hydatid reaction is the development of an area of erythema with subjacent induration that subsides in from 12 to 24 hours. This may be an intense reaction. This delayed reaction, if positive is diagnostic of hydatid disease but occurs in only about 50 percent of patients. It is of no value in the diagnosis of recurrent or residual cysts. A certain number of patients given the skin test regardless of the results of the test will show an increase in the eosinophils in the blood from 24 to 48 hours after the test. This is of diagnostic value. The precipitin test, said to be positive in 65 percent of patients with the disease and the complement fixation test, an exacting laboratory procedure reported by various authors as positive in from 60 to 80 percent of patients are also used.

**Treatment.** These cysts should be treated because they may suppurate or perforate into bile ducts or the peritoneal cavity. One of the

(6) Halberstadt, A. J.: Masses calcifican fil et; cas report with data in histology on basis of solar hydatid disease. *Am J Roentgenol.* 55: 189-190, Feb. 1946.

(7) Gross, A. (Montevideo): Hydatid allergy. *Ann. Allergy* 4: 207-212, May-June 1946.

(8) Casoni, P. et al.: review. *Ped. St. Grad. M. J.* 23: 203-204, July 1946.

following surgical procedures may be used: (1) Removal of the cyst contents followed by suture of the adventitia without drainage; (2) removal of the cyst contents followed by marsupialization and drainage of the adventitia, (3) removal of the cyst contents without suture or drainage of the adventitia, or (4) total removal of the cyst (9). In the first three procedures the usual technique is to aspirate a small quantity of the fluid depending on the size of the cyst, and replace this with a 2 percent solution of formaldehyde in water. This is allowed to remain in the cyst for at least 5 minutes. The cyst is then evacuated of its contents after being carefully packed off from the surrounding tissues. The walls of the cyst are then carefully wiped clean with the formaldehyde solution. If the cyst is marsupialized it is usually packed with gauze and left in place for 6 days. A small amount of the pack is removed each day until it is all out on the tenth or eleventh day. The defect in the liver usually fills in, but it may drain for an indefinite period. The senior author's cyst, not reported in this article which was marsupialized and packed with glycerin gauze following which complete extrusion of the cyst wall occurred on about the twenty-first day. The defect in the liver filled in rapidly. This was so dramatic that in cases of marsupialization, packing with glycerin may be considered in the postoperative management of these patients. It was supposed that the hygroscopic effect of the glycerin caused shrinking of the cyst lining. Dorrance and Bransfield (10) reported a patient who was marsupialized 5 years previously who had developed chronic sinus from which daughter cysts were exuded periodically. The patient was treated with iodine on the drainage promptly ceased, and the sinus healed in about a month. The rationale was the effect of the radiation on the germinal layer. The ideal treatment, if technically possible is complete excision of the cyst.

### CASE REPORTS

**Case 1.** A 60-year-old man, who had lived in Italy until 10 years before was admitted to the hospital on 15 August 1949 complaining of epigastric pain following meals. One year prior to this his local physician had operated on him for an epigastric mass and reported finding no operable carcinoma. Physical examination on admission revealed a thin somewhat plethoric man without distress. A mass about the size of grapefruit was felt in the epigastrium. The patient had been aware of this mass since 1910. The laboratory findings were normal. A roentgenogram of his abdomen revealed a partially calcified cystic lesion apparently attached to the inferior border of the liver (fig. 1). A tentative diagnosis of chilococcal cyst of the liver was made and on 19 August a laparotomy was performed. Four cystic lesions were found in the liver, 3 in the inferior border and 1 in the lateral part of the right lobe. The 3 cysts

(9) Arce, J. H. Cystic liver. *Arch. Surg.* 42: 973-987 Jan. 1941.

(10) Dorrance, C. V. and Bransfield, J. L.: Evaluation of surgical treatment for chilococcal cysts of liver followed by deep x-ray therapy. *Am. J. Trop. Med.* 7: 77 Jan. 1947.



*Figure 1 (case 1). Roentgenogram after barium meal showing calcified cyst wall displacing stomach to the left.*

in the left lobe were removed intact and the fourth cyst was left for a second stage because of its inaccessibility at that time. On 11 February 1950 he was readmitted and the cyst in the right lobe was excised. The pathologist reported echinococcus cysts of the liver.

**Case 2.** A 54-year-old man who had lived in Greece until 16 years of age was admitted to the medical service on 15 August 1950 with pneumonia. During the routine physical examination he was found to have a nontender round mass about the size of a large grapefruit in the epigastrium. The mass was not fixed and moved with respiration. The patient had been aware of this mass for at least 10 years. His only abdominal complaint was discomfort after a large meal and indigestion at times. On recovery from his pneumonia he was transferred to the surgical service. Laboratory findings were normal.

A gastrointestinal series revealed a paraesophageal hiatal herniation of a portion of the cardiac end of the stomach. There was evidence of some extrinsic pressure along the lesser curvature (fig. 2) and on a lateral film the stomach was seen to be displaced posteriorly. It was believed from the clinical and roentgenologic evidence that this was a cyst arising from the left lobe of the liver and even though no antigen was available for the Casoni skin test that it was echinococcal in origin. A laparotomy was performed on 20 September and a large cystic mass arising from the left lobe of the liver was found. The hiatal hernia was noted but was not repaired because of the extensiveness of the operative procedures necessary for the removal of the cyst. This unilocular cyst substance intact was removed from the liver (fig. 3) by sharp and blunt dissection using large mattress sutures to control the



Figure 2 (case 2). Roentgenogram revealing stomach displaced to the left and downward by an extrinsic mass. Figure 3 (ca 2). Gross specimen showing daughter cysts.

hemorrhage and then smaller mattress sutures to close the defect. Several large venous sinuses were ligated individually.

Examination of the cyst revealed the wall to be composed of fibrous and collagenous tissue. A section of one of the daughter cysts revealed numerous typical brood capsules. Hooklets were identified from the specimen, confirming the preoperative diagnosis. The patient was seen 30, 60 and 90 days postoperatively. His appetite was excellent and he stated that he had only an occasional attack of indigestion. A second gastrointestinal series revealed the paraesophageal hiatal hernia of the stomach to be unchanged.

### BOOK REVIEW

*Methodology and Technique for the Study of Animal Societies* by J. P. Scott, John B. Calhoun, C. R. Carpenter, N. E. Collias, John T. Emlen, J. L. Fuller, Leonard J. Goss, Lawrence Irving, Bernard F. Riess, T. C. Schneier, and John W. Scott. Editor: Roy Waldo Miner, Associate Editor: B. J. Hagen, Consulting Editor: J. P. Scott. Volume 51, Art. 6. Pages 1001-1122 of *Annals of the New York Academy of Science*. Illustrated. The New York Academy of Science. New York publisher. November 7, 1950. Price \$2.50.

This series of papers is the result of work begun in 1946 at which time a conference on genetics and social behavior in animals resulted in the recognition of the need for field studies of natural animal groups. Following a forward by J. P. Scott these studies include (1) General Plans and Methodology for Field Studies of the Naturalistic Behavior of Animals by C. R. Carpenter (2) The Social Behavior of Dogs and Wolves: an Illustration of Sociobiological Systematics by J. P. Scott (3) The Relationship between Observation and Experimentation in the Field Study of Behavior by T. C. Schneier (4) Measurement of Some Physiological Reactions to Arctic Conditions by Lawrence Irving (5) Instruments for the Measurement of Physiological Reactions of Unrestrained Animals by J. L. Fuller (6) Effects of Nutrition and Diseases on Experimental Animals by Leonard J. Goss (7) A Study of the Phylogenetic or Comparative Behavior of Three Species of Grouse by John W. Scott (8) Social Life and the Individual among Vertebrate Animals by N. E. Collias (9) The Isolation of Factors of Learning and Native Behavior in Field and Laboratory Studies by Bernard F. Riess (10) Techniques for Observing Bird Behavior under Natural Conditions by John T. Emlen and (11) The Study of Wild Animals under Controlled Conditions by John B. Calhoun. This series is no more than an introduction to the subject and is in no way a complete reference work.

—Lt. Col. K. H. Willers, V.C., U.S.A.



## BOOK REVIEW

*Genetics in Ophthalmology* by Arnold Sorsby Research Professor of Ophthalmology Royal College of Surgeons and Royal Eye Hospital, Surgeon, Royal Eye Hospital London. 265 pages; illustrated The C. V. Mosby Company St. Louis Mo. publisher 1951 Price \$9.50

The fact that congenital and hereditary defects of the eyes though not numerically the most significant cause are responsible for the greatest amount of blindness as measured in years has prompted the author to prepare this clear concise and tremendously interesting book. The first section is devoted to a theoretical discussion of modes of inheritance gene mechanisms chromosome mechanisms environmental factors illustrative pedigrees and clinical varieties of genetic disease. The latter includes short descriptions of congenital anomalies abiotrophic anomalies phacomatoses neoplasms metabolic disorders functional derangements and syndromes. A chapter on prospects the control of genetic disease follows. This section is appealing for its crystal-clear review of the subject of genetics in general. Numerous excellent diagrams and drawings are helpful.

Section 2 deals with isolated ocular anomalies considering changes in the globe as a whole cornea lens uveal tract retina optic nerve and other tissues in that order. The discussions of corneal dystrophies and cataracts are particularly well illustrated. The summary of the features of Leber's disease is excellently presented. Each condition described is accompanied by diagrams of a illustrative pedigree which keeps the genetic aspect constantly in the mind of the reader. The colored illustrations of this section are especially good.

The third and last section describes ocular aspects of generalized disorders. The discussions of metabolic disorders albinism afflictions characterized by abnormal blood and tissue chemistry skeletal disorders central nervous system abnormalities dental anomalies allergic diseases and a group of mesodermal ectodermal and neuroectodermal syndromes should appeal to all physicians regardless of specialty. Dr. Sorsby's description of each condition is complete but brief which makes the entire text most readable. The discussions of transmissions of various conditions genetically should be of assistance to all physicians in advising their patients what eye abnormalities to expect in their children. The print is clear the paper is of good quality and the book well bound.

—Lt. Col. F. E. Hull, MC U S A

# Antibiotics in the Treatment of Relapsing Fever

Ira B. Harrison *Major MC, U. S. A.* (1)

Richard M. Whittington *Captain, MC, A. U. S.* (1)

**I**N RECENT textbooks (2, 3) it is stated that penicillin in large doses only is effective in the treatment of animals experimentally infected with spirochetes of the genus *Borrelia*, the causative organism of relapsing fever. Although initial clinical experience with penicillin in conventional doses has been reported to be disappointing, our recent experience with 6 cases of relapsing fever occurring among United Nations forces in Korea indicates that penicillin used in large doses is efficacious in the treatment of human beings with this disease. Comparable results have been observed in 1 patient treated with streptomycin.

## CASE REPORTS

**Case 1** A 19-year-old Negro was admitted to this hospital on 28 April 1951 with a history of a 5-day illness characterized by chilly sensations, headache, generalized muscular pain, arthralgia, cramping abdominal pain, and persistent fever. The onset of his illness was insidious and was associated with anorexia and malaise. He gave no history of contact with an insect vector. On admission his temperature was 104° F. His pharyngeal mucosa was infected and there was tenderness in the right upper abdominal quadrant. His leukocyte count was 14,800 with a normal differential count. His icterus index was 8 and his thymol turbidity was 6 units. A smear of the peripheral blood stained with Wright's stain showed many organisms typical of *Borrelia*. The patient was given 200,000 units of aqueous penicillin intramuscularly every 6 hours for 10 days. His temperature fell by crisis to

(1) Fourth Field Hospital.

(2) Simmons, J. S. Relapsing fever. In Cecil R. L. Textbook of Medicine, 7th edition. W. B. Saunders Co., Philadelphia, Pa., 1947, pp. 417-423.

(3) See on P. B. Relapsing fever. In Harrison T. R.: Principles of Internal Medicine, 1st edition. The Blakiston Co., Philadelphia, Pa., 1950, pp. 996-998.

normal after the third injection of penicillin and did not become febrile again during a hospital observation period of 3 weeks. Daily peripheral blood smears showed no spirochetes after 24 hours of therapy. His symptoms abated promptly after the fever subsided and his convalescence was uncomplicated.

**Case 2.** A 30-year-old Negro was admitted on 2 May 1951 with a history of a 9-day febrile episode terminating 5 days previously. It had been characterized by chills, fever, nausea, vomiting, cramping abdominal pain, and headache. He had been treated empirically with chloroquin without satisfactory response. On the day of admission he experienced similar symptoms and his temperature rose to 103° F. He recalled having noticed several "bites" on his arm about 5 days before the first onset of fever but had noted no lice. He appeared to be dehydrated and had bilateral axillary adenopathy and abdominal distention associated with generalized tenderness, most pronounced in the upper quadrants. His leukocyte count was 10,500 with a normal differential count. His icterus index was 4 and his thymol turbidity was 12 units. Spirochetes typical of *Borrelia* were seen in the peripheral blood smear. He was given aqueous penicillin. His temperature promptly fell to normal. Spirochetes were not seen in the peripheral blood smear after the second hospital day. He was asymptomatic after 2 days of therapy and there was no relapse during a 3-week period of observation. The thymol turbidity test returned to normal.

**Case 3.** A 22-year-old Belgian was admitted on 13 May 1951 because of hysterical aphonia. On 15 May he had an initial febrile episode with a temperature of 99.6° F. The following day his temperature rose to 104° F. At this time he had minimal nonspecific complaints compatible with fever. There was no history of vector contact. Physical examination was negative. The leukocyte count was 6,550 with a normal differential count. A blood smear was negative for *Borrelia* or plasmodia. His temperature fell to normal by crisis on the following day. His speech returned to normal with amyotrophic paresis and he returned to duty on 20 May. Later that day his temperature again rose to 103.2° F and he was readmitted complaining of dizziness, photophobia, blurring of vision, headache, nausea, and vomiting. The only positive physical finding was tenderness over the right costovertebral angle. His leukocyte count was 13,200 with 87 percent neutrophils. His thymol turbidity was 7 units. His icterus index was 7. Urinalysis showed a 3 plus albumin and numerous fine granular casts. Organisms typical of *Borrelia* were noted in the peripheral blood smear. The patient was given 200,000 units of aqueous penicillin every 6 hours. *Borrelia* were not seen in the peripheral blood after 12 hours. He was afebrile and asymptomatic in less than 24 hours. Treatment was continued for 10 days and during this time laboratory studies were repeated and found to be normal. The patient was observed for 3 weeks during which time there was no relapse.

**Case 4.** A 19-year-old man was admitted on 18 May 1951. He had been in good health until 13 May when he experienced nausea, vomiting, chills, and fever. This was followed by anorexia, diarrhea, and dizziness. On 15 May he sustained a gunshot wound of the left forearm resulting in a compound fracture of the radius. Coincidental with this battle injury his temperature rose to 103° F. He denied contact with lice. At another hospital physical examination revealed in addition to the gunshot wound, a palpable nontender liver and minimal generalized lymphadenopathy. The leukocyte count was normal. *Borrelia* were reported to be present in the blood smear. His wound was debrided, the forearm placed in a cast, and he was given three injections of 300 000 units of procaine penicillin at 12-hour intervals. On admission to this hospital, 12 hours after the last penicillin injection, his temperature was 102.8° F. The above physical findings were confirmed. A peripheral blood smear was still positive for *Borrelia*. His icterus index was 15 and his thymol turbidity was 8 units. His temperature rose to 105.4° F in the hour after admission and treatment with 200 000 units of aqueous penicillin every 6 hours was instituted. Within 12 hours his temperature had returned to normal and he was asymptomatic. Repeated blood smears failed to reveal *Borrelia*. His icterus index and thymol turbidity returned to normal. Treatment was continued for 10 days and no relapse occurred. The patient had to be evacuated because of his fracture and could not be observed further.

**Case 5.** A 26-year-old man was admitted on 7 May 1951 with a febrile illness of 6-day duration. He recalled having had contact with lice 1 week before the onset of his illness. Symptoms included chills, fever, anorexia, nausea, muscular and joint pain, headache, dizziness, insomnia, and vague abdominal discomfort. His temperature was reported to be 103.4° F at another hospital where he was admitted on the third day of his illness. *Borrelia* were found in the peripheral blood smear. He was given 300 000 units of procaine penicillin twice daily. After 24 hours of therapy he was reported to be afebrile and the blood smear reported to be negative for *Borrelia*. On admission to this hospital his temperature was 97.6° F, he was moderately dehydrated and had slight generalized lymphadenopathy. The presence of *Borrelia* on the initial transmitted slide was confirmed. Subsequent serial smears were negative. He was given 200 000 units of aqueous penicillin every 6 hours for 10 days and was observed for 3 weeks. He remained afebrile. His convalescence was uncomplicated.

**Case 6.** A 19-year-old Negro was admitted on 18 May 1951 with a history of hospitalization elsewhere 2 weeks previously for a febrile illness. This had been abrupt in onset with frank chills, headache, generalized muscular aching, and anorexia. He recalled having had lice about 5 days prior to the onset. His fever was of 5-day duration, terminating abruptly. He had been given 2 injections of penicillin daily for 4 days and returned to duty when his fever had subsided. About 10

days later he experienced similar symptoms, again of abrupt onset, with a frank chill. On admission his temperature was 104° F. His leukocyte count was 18 950 with a normal differential count. A peripheral blood smear was positive for *Borrelia*. He was given aqueous penicillin. A blood smear 16 hours after starting treatment was negative for *Borrelia*. His temperature fell to normal within 24 hours, and remained normal throughout the 3 weeks of hospitalization. His convalescence was uneventful.

**Case 7** A 22-year-old man was admitted on 20 May 1951 with a history of a 3-day febrile episode about 2 weeks before admission. The illness was of abrupt onset with frank chills, generalized muscular aching, anorexia, nausea, malaise and headache. Following this febrile period he was symptom-free for 10 days when he again experienced the symptoms mentioned. He was admitted to another hospital with the following recorded findings: a temperature of 103° F, dehydration, tenderness in the right upper abdominal quadrant, and palpable liver. A peripheral blood smear was positive for *Borrelia*. He had been given 250 mg. of aureomycin every 4 hours. He was transferred to this hospital 2 days later. At that time he was afebrile and asymptomatic. The only positive physical finding was palpable spleen. A peripheral blood smear showed no spirochetes. His leukocyte and differential counts were normal. His icterus index was 6 and his thymol turbidity was 3 units. All therapy was discontinued. He was observed for 3 weeks and had no relapses.

### SUMMARY

Six of 7 patients with louse-borne relapsing fever occurring in April and May 1951 among United Nations forces in Korea were treated with 200 000 units of aqueous penicillin every 6 hours for 10 days. One of these patients presumably relapsed after previous treatment with procaine penicillin. Another patient was still febrile and had demonstrable spirochetes in his blood after treatment with 900 000 units of procaine penicillin over a 36-hour period. In all the patients treated with aqueous penicillin, there was prompt remission and no relapses occurred. No Herxheimer reactions were observed. One patient was treated with aureomycin with comparable results.

### CONCLUSIONS

Aqueous penicillin in doses of 200 000 units every 6 hours is an effective agent in the treatment of relapsing fever.

Aureomycin appears to be equally effective. Further clinical trial of this drug is warranted.

# Intrahepatic Calcification

Seymour A. Kaufman *First Lieutenant, U. S. A. F. R. (MC) (1)*

**A**LTHOUGH calcification in certain structures of the body is not unusual in the liver it is an uncommon finding. A patient in whom intrahepatic calcification was found was recently studied at this hospital.

## CASE REPORT

A 43-year-old man was admitted with the symptoms of a peptic ulcer. He had had these symptoms for 6 months. The diagnosis of an active duodenal ulcer was confirmed and the patient responded well to medical treatment. Follow-up examinations showed evidence of healing. X-ray examination on admission revealed a deformed spastic duodenal cap with a small ulcer niche on the lesser curvature near the apex. There was a round area of amorphous calcification measuring 3.5 by 4 cm in the right upper quadrant of the abdomen (fig. 1). Following a cholecystogram, barium enema and gastrointestinal series this was identified as lying within the right lobe of the liver. Liver function tests were within normal limits.

## DISCUSSION

In routine roentgenologic practice intrahepatic calcification is usually an incidental finding. That it is an unusual observation is attested to by the many reports describing a single case. In a series of 8,000 autopsies it was encountered only once and its cause was undetermined (2). A review of the recent literature reveals that most of the cases are of undetermined cause and are diagnosed by exclusion as being due to calcification in an echinococcal cyst (3). Other less common causes of calcification have been described (4).

(1) U. S. A. F. Hospital, Walter Air Force Base, Mass.

(2) Heilbrunn N. and Klatsch, A. J. Massive calcification of liver; case report with discussion of etiology on basis of liver hydatid disease. *Am. J. Roentgenol.* 55: 89-192, Feb. 1946.

(3) Perkins C. W. Large hydatid cyst of liver; case report. *Am. J. Roentgenol.* 64: 473-474 Sept. 1950.

(4) McCullough, J. A. L., and Sutherland C. G. Intraperitoneal calcification. Interpretation of its roentgenologic small stations. *Radiology* 36: 450-457 Apr. 1941.

Echinococcosis is rare in this country 95 percent of the patients being of foreign birth (5) The etiologic factors pathogenesis and clinical findings are well documented in many excellent publications originating from outside the United States (6,7) and in the standard textbooks of parasitology (8) The liver is the organ most frequently involved being the site of disease in about 65 percent of the patients.



Figure 1. A lateral view of right upper quadrant showing round area of calcification in relation to the hepatic flexure.

The lungs are involved in 22 percent with the spleen, kidney bone secondary implants in the peritoneum, muscle and brain being the site of the disease in progressively smaller number (6,7).

Radiologically the hydatid cyst may be manifested by globular areas of calcification within the liver substance and on occasion,

(5) Roekus, H. L. Gastro-enterology Volume III W. B. Saunders Co., Philadelphia, Pa. 1946.

(6) Oosterhuis, S. F., and F. J. J. van der Vliet. Hydatid disease. Radiology 53: 248-254, Aug. 1949.

(7) Schlangier, P. M., and Schlangier, H. J. Hydatid disease and its roentgen picture. Am. J. Roentgenol. 60: 331-347, Sept. 1948.

(8) Mack, T. T., Hunter, G. W., and Worth, C. B. A Manual of Tropical Medicine W. B. Saunders Co. Philadelphia, Pa., 1945.

floating bodies within a membrane may be demonstrated (9) Hepatomegaly an elevated right diaphragm, pleural reaction, and pulmonary infiltrates have been described as accompanying the hepatic cyst (7). If the cyst achieves sufficient size it may displace any of the abdominal viscera in the vicinity of the liver Hydatid disease in other organs of the body is usually diagnosed on the basis of symptoms and roentgenographic findings A round reticulated shadow in a roentgenogram of the liver is thought to be almost pathognomonic of an echinococcus cyst and the diagnosis has been made from the roentgenographic findings alone in many of the reported cases

There are no constant clinical findings in hydatid disease The signs and symptoms depend in great part on the location and size of the cyst In the liver the great majority are silent The diagnosis may be confirmed by the Casoni skin sensitivity test or the complement fixation test An eosinophilia is found in from 20 to 25 percent of the patients (8), although some authors believe that all active cases show an eosinophilia (6) Often however the biologic tests may be negative presumably because of death of all the organisms and the diagnosis has been established in these patients by examination of the surgical specimen (10).

Intrahepatic calcification other than that which occurs in an echinococcal cyst is infrequently found It has been described in old pyogenic abscesses and in tuberculosis as part of a generalized disease process (11) Liver calculi or intrahepatic calcium containing gallstones have been noted on a few occasions (12) The diagnosis of each of these conditions should be evident from the history and clinical evaluation Still rarer causes of calcification that have been reported are primary hepatic carcinoma (13) hemangiomas (14) and in metastasis from an ovarian malignancy (15) Simple cysts of the liver have rarely been noted to calcify (5) Primary teratoma (16) Hodgkin's disease and gummas have also been suggested as possible causes of intrahepatic calcification (17)

(9) Cougin, A. Segni radiologici diretti d'idatihepatica. (Direct radiological signs of liver echinococcosis.) *Ann. radiol. diag.* 22: 74-80 Jan. Feb. 1950.

(10) Ami, R. M. Calcified echinococcosis of liver with thoraco-abdominal symptoms. *Radiol. Clin. N. Y.* 17: 193-199 July 1948.

(11) Caffey, J. *Pediatric X-Ray Diagnosis*, 2d edition. Year Book Publishers Inc. Chicago Ill. 1950.

(12) Golden, R. *Diagnostic Roentgenology*, Volume II. Thomas Nelson and Sons New York N. Y. 1950.

(13) Hunt: Personal communication, cited by Golden (12).

(14) Aspray, M. Calcified hemangiomas of liver. *Am. J. Roentgenol.* 53: 446-453 May 1945.

(15) Nathanson, L.: Calcified metastatic deposit in peritoneal cavity liver and right lung field from papillary cystadenocarcinoma of ovary. *Am. J. Roentgenol.* 64: 467-469 Sept. 1950.

(16) Alpert, A. Personal communication.

(17) Astley, R. and Harrison, N. Miliary calcification of liver; report of case. *British J. Radiol.* 22: 723 Dec. 1949.



In a given patient an exact etiologic diagnosis of calcification in the liver cannot always be made. For practical purposes an isolated finding of a globular area of intrahepatic calcification may be assumed to be caused by an echinococcus cyst. Such an area may become quite large, measuring from 12 to 15 cm. in diameter, and is found most frequently in the right lobe of the liver. The liver function tests may be normal and the patient asymptomatic. All confirmatory x-ray and biopsy tests are often negative.

In the patient reported here the area of calcification was smaller than usual. The patient was native born and had spent most of his time in the service within the continental United States and on overseas duty. Confirmatory evidence for a diagnosis of hydatid disease was absent but this was considered the most likely diagnosis. His symptoms were undoubtedly caused by his duodenal ulcer and bore no relationship to the findings in his liver.

## BOOK REVIEW

*Management of Celiac Disease*, by Sidney V. Levine, M. D., Professor of Pediatrics and Director of the Department, New York Polytechnic Medical School and Hospital, Consultant, Leabason Hospital, Harlem Hospital, and Riverside Hospital for Contagious Diseases of the New York Health Department; Fellow of the New York Academy of Medicine and Merrill Patterson Lines, M. D. 188 pages; 12 illustrations. J. B. Lippincott Co., Philadelphia, Pa. published 1951. Price \$5.

This excellent monograph is a veritable classic on a interesting diagnostic and therapeutic problem written by authors with 30 years of experience in the successful study and treatment of this disease. It is especially recommended for physicians in the fields of pediatrics, general practice and internal medicine because the disease occurs chiefly between the ages of 1 and 5 years. The book, which deals with the historical background and our present knowledge of this disease, will be read with enjoyment from cover to cover. It is suggested, however, that the reader be sure to read the summary first.

The reader is left with the impression that here is a disease for which there is a successful dietary treatment as championed by the authors but for which a cause has not yet been proved although circumstantial evidence points to the possible formation of a intestinal irritant through the transformation of complex carbohydrates by bacterial action as the cause of celiac disease. An extensive bibliography is appended.—Commander C. F. Park, MC, U. S. N.

# Relationship of Armed Forces Research to Clinical Ophthalmology

Henry A. Linn Ph. D. (1)

THE mission of the Medical Departments of the Department of Defense in addition to the prompt and adequate care of the sick and wounded, is to maintain the health and well being of every member of the service. This program of preventive medicine begins with the first medical examination on admission and continues throughout the individual's career. On discharge for medical reasons, the Veterans Administration may continue the medical care and may provide rehabilitation services.

During World War I visual standards for the various services were established by necessarily arbitrary decisions by ophthalmologic consultants to the Surgeons General of the Army and Navy. Much of the emphasis on high visual standards was brought about by the advent of aviation. Between wars there was little need to review the established standards because there was a plentiful supply of men who could meet the requirements and who volunteered for military service.

During the year of hurried preparation prior to Pearl Harbor, some thought was given and action taken relative to visual requirements for special jobs. For example a research project was undertaken at the Coast Artillery School at Fort Monroe to determine standards for range finder operators. At New London, Conn. the developing Naval Medical Research Laboratory was studying visual requirements for submarine personnel. At the Schools of Aviation Medicine Pensacola (Navy) and Randolph Field (Army) studies of space perception and motor anomalies were undertaken. All of these activities were expedited greatly with the mobilization for World War II. The Armed Forces National Research Council (NRC) Vision Committee, and the NRC Committee on Ophthalmology rendered valuable consultative services in reviewing visual standards, vision testing techniques, ophthalmologic supply tables and field medical kits.

(1) Psychophysiology Branch, Biosciences Group, Office of Naval Research.

In general the ophthalmologic research program of the military departments is very relevant to operational or industrial problems. Operational problems include the visual requirements for specific military operations (rangefinders in tanks); visual standards for air crews (pilot, bombardier); night visual performance of night lookouts, night-fighter pilots or commando-type operations; the use of contact lenses by pilots or by ground troops; and visual factors in the use of binoculars, telescopes and periscopes. Industrial problems include the protection of the eyes from flying particles, radiation and flash burns, chemical burns, visual factors in job performance and color and intensity of illumination and surroundings.

In addition, both fundamental and clinical research in ophthalmology are conducted by ophthalmologists in military facilities, such as Army hospitals, naval hospitals, the National Naval Medical Center, the Naval School of Aviation Medicine at Pensacola, Fla., the Naval Submarine Base at New London, Conn., and the Air Force School of Aviation Medicine at Randolph Air Force Base, Tex.

In the naval facilities, some of the research of interest to clinical ophthalmologists includes (1) *The Color Atlas of Pathology* recently produced by the U. S. Naval Medical School, National Naval Medical Center, Bethesda, Md., (2) the development of eye prostheses for hospitalized naval personnel (2); (3) the development and evaluation of tests of color perception (3); (4) the evaluation of vision screening devices such as the ortho-rater, sight-screener and telebinocular against standard ophthalmologic examinations (3); (5) the testing of dark adaptation and night visual perception (3); (6) research on perimetry and campimetry (3) and (7) the evaluation of vision testing equipment (4).

Much of the ophthalmologic research in the Army is being accomplished in the Eye Department of the Walter Reed Army Hospital in Washington, D. C. This research concerns (1) visual standards for various Army jobs, as well as visual requirements for admission to West Point and Reserve Officers Training Corps programs; (2) the effect of cortisone on ocular diseases and the treatment of ocular injuries; (3) such protective devices as spectacles for use in gas masks by air troops and for other special tasks; and (4) the selection and training of personnel to operate optical units for the dispensing and repair of spectacles.

Under Army contracts researchers at Columbia University and Harvard University have been working on the use of contact lenses. They have been interested in the effect of contact lenses on the transparency, metabolism and hydration of the cornea, as well as on the histol-

(2) At the U. S. Naval Hospital, Philadelphia, Pa.

(3) At the U. S. Naval Medical Research Laboratory, New London, Conn.

(4) At the U. S. Naval School of Aviation Medicine, Pensacola, Fla.

logic and vascular changes resulting from the wearing of such lenses. Studies have been made also of changes in the pH of the contact-lens solution which occurs while the lens is in place on the cornea.

The Adjutant General's Office of the Army is conducting research on the relationship between photopic acuity and tests for night vision. Their major interest, however, concerns visual factors in job performance.

The Department of Ophthalmology at the Air Force School of Aviation Medicine, Randolph Air Force Base, San Antonio, Tex., has a large research staff working on such ophthalmologic problems as

1. The effect of anoxia on the excitatory mechanisms of the retina and visual pathways. They have shown that in response to illumination of the eye of the rabbit the visual cortex survived anoxia for about 2 minutes while the optic tracts were active up to a period of 5 minutes. They found also that the phenomena of summation, facilitation and inhibition are affected deleteriously in the early stages of anoxia.
2. Continuing Berens' early work on visual fatigue, they have developed a new ophthalmic ergograph and have conducted a number of studies on this subject. They have been able to differentiate between normal subjects and those with asthenopic symptoms on the basis of ergograph findings. These differences they describe in the following manner. In normal persons (a) there is an increase in both accommodation and convergence with a shift of phoria in the direction of esophoria; (b) there is a marked increase in positive convergence with a slight decrease in divergence; and (c) these effects are transient and readings return to habitual levels within 30 minutes. In asthenopes on the other hand there is (a) a decrease in accommodation with esophoria or no exophoria at near vision, (b) low prism divergence; and (c) evidence of fatigue of accommodation by recession of the near point and none of the muscle balance changes found in normal persons. As a result of the above findings it was recommended that the muscle balance for near vision should not exceed 2 prism diopters of exophoria, accompanied by a prism divergence of from 12 to 15 prism diopters in aviators.
3. The use of contact lenses by pilots.
4. The phenomenon of night myopia.
5. Evaluation of the use of visual screening devices in selecting candidates for flight training.
6. The testing of visual acuity tested with objects at high angular speed.
7. Motion parallax as a factor in depth perception.
8. Visual factors in reading flight instruments and radar scopes and color perception as related to the discrimination of flare signals.

The Armed Forces recognize the importance of preventive medicine whether it be in the field or in home bases in the air or at sea, or in military industrial laboratories and shops. Every effort is made, both by research and in operating practices to protect the eyes from damage by missiles, flames, chemicals, radiation, and desiccation. When injuries do occur, treatment is prompt and efficacious. In patients with partial or complete loss of sight, rehabilitative measures are instituted long before discharge from the hospital.

### BOOK REVIEW

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*Review of Physiological Chemistry by Harold A. Harper* Ph. D. Professor of Biology (Biochemistry), University of San Francisco. Lecturer in Surgery, University of California School of Medicine, San Francisco; Biochemist Consultant to Metabolic Research Facility, U. S. Naval Hospital, Oakland, Director Biochemistry Laboratory, St. Mary Hospital, San Francisco. 3d edition. 260 pages; Illustrated. University Medical Publishers, Palo Alto, Calif., 1951. Price \$3.50.

This new edition brings up to date an excellent review of the fundamentals of physiologic chemistry prepared as a supplement to standard texts in the subject and a companion volume for students in biochemistry. The author begins with presentation of the principles of general and physical chemistry which although simple are frequently forgotten and must be reviewed by the physician, dietitian, and nutritionist. This is followed by chapters on the organic chemistry of the carbohydrates, lipids, proteins, nucleoproteins, and nucleic acids, vitamins, enzymes, and hormones. Separate chapters are devoted to the blood, lymph and cerebrospinal fluid, biologic oxidations, digestion and absorption, detoxication, metabolism, functions of the liver and kidney, water and minerals, calorimetry, and the chemistry of the tissues. Many excellent charts, illustrations, and tables aid in explaining and simplifying various physiologic mechanisms. The book would be valuable to anyone desiring a quick review of this field. The use of larger type would facilitate more rapid reading.

—Maj. E. M. Parrott, MSC, U. S. A.

# Diagnostic Significance of Fragment Displacement in Fractures of the Carpal Navicular<sup>(1)</sup>

George H. Chambers, Captain, U. S. A. F. (MC)

John D. Blair, Colonel, MC, U. S. A.

**F**RACTURE of the carpal navicular has become a widely known entity largely because of increased awareness of the condition. Unfortunately educational emphasis has not been generally disseminated to the medical profession regarding frequently associated dislocation of the lunate bone or perilunar dislocation of the carpus.

Nearly every orthopedist has had patients referred to him with a condition diagnosed solely as a fracture of the navicular only to discover a coexisting dislocation of the lunate or a perilunar dislocation. One of us (JDB) had the opportunity at the European Command Fracture Center over a period of nearly 3 years to see many patients transferred to the Center with such a coexisting lesion which had not been diagnosed. In an informal discussion of these cases Lieutenant Colonel Wilhelm A. Zuelzer, MC, made the observation that patients with fractured navicular associated with coexisting perilunar dislocations seemed to exhibit a gross displacement of the navicular fragments in relation to each other. On the other hand in patients with a fractured navicular alone the fracture fragments are found in normal relationship to each other. Following the discussion subsequent cases were more closely studied on arrival and the following was observed. (1) No patient with a fracture of the navicular alone showed gross displacement of the fracture fragments in relation to each other. (2) every patient with perilunar dislocation seen with an associated fracture of the navicular had gross displacement of the navicular fragments in relation to each other. (3) every patient with a fractured navicular

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(1) Brooke Army Hospital, Fort Sam Houston, Tex.

showing gross displacement of the fragments in relation to each other was shown to have a coexisting perilunar or lunate dislocation, and (4) following reduction of the lunate or perilunar dislocation the displaced navicular fragments tended to resume their normal anatomic relations to each other.

TABLE 1. *Navicular fracture*

Location of fracture	Without displacement	With displacement
Waist	49	0
Tubercle	2	0
Body	17	0
Total	68	0

A review of the navicular injuries seen at Brook Army Hospital from 1947 to 1951, made by one of us (GHC), revealed 75 patients with a fractured navicular. Sixty-eight of these showed no displacement of fragments (table 1). Seven had displacement of the fracture fragments. Three of the seven were associated with volar dislocation of the carpal lunate and four with perilunar dislocation (tables 2 and 3).

TABLE 2. *Dislocation (volar) / lunate*

	Fragment displacement	No displacement
With associated fractures	Through waist 2	0
	Through body 1	
Without associated fractures	0	2
Total	3	2

TABLE 3. *Perilunar dislocation*

	Fragment displacement	No displacement	
With associated fractures	Through waist 3	0	
	Through body 1		
Without associated fractures	0	0	—
Total	4	0	—

## SUMMARY

The records of 75 patients with fracture of the carpal navicular were reviewed, 68 of these were not associated with other wrist injuries and none had separation of the navicular fragments. 7 had displacement of the navicular fragments and each of them was associated

with either volar dislocation of the lunate or perilunar dislocation of the wrist. Only 2 of these 7 were the result of recent acute injuries and in both instances the reduction of the dislocation brought anatomic apposition of the navicular fragments.

The above data plus other clinical experience indicate that in acute navicular fractures gross displacement of the fragments may frequently indicate coexisting lunate or perilunar dislocation. Since disability is so marked in untreated dislocations of the wrist and diagnosis of such dislocations is so often overlooked, when displacement of navicular fragments is seen it should be axiomatic that coexisting dislocations of the carpus should be searched for and either demonstrated or ruled out.

## BOOK REVIEWS

*Clinical Tropical Medicine*, R. B. H. Gradwohl, M. D. Editor-in-Chief Luis Bendi x Soto, M. D. and O. car Felsenfeld, M. D. Editors 1 647 pages 473 illustrations and 6 color plates The C. V. Mosby Company St. Louis, Mo publisher 1951 Price \$22.50

Medical officers of the Armed Forces and allied services are always keenly interested in the appearance of publications on tropical medicine. This book is particularly inviting because it is a collaborative effort. No one person can spend sufficient time in all sections of the tropics to know intimately all of the indigenous entities encompassed by tropical medicine. It is odd therefore that previous textbooks on this subject have not been the compiled writings of several authors.

All conditions one meets in warm climates are discussed completely in this book by experienced clinicians or biologists. Besides excellent clinical description, each disease is adequately covered with respect to history, cause, life cycles of vectors, descriptions of intermediate hosts, laboratory and immunologic methods of diagnosis and prophylaxis. The illustrations are excellent, but more of them should have been in color. Those on pages 448 and 1255 demonstrate pulicine and ophiidian ecstasy remarkably well.

The weakest feature of this book is the description of treatment. Too much space has been allotted to antiquated and inefficient methods of the past and modern advances are too often barely mentioned or merely alluded to in footnotes. It is realized that clinical evaluation with some of the newer drugs has been too recent for inclusion in a textbook, but a book published in 1951 should indicate more current trends in the employment of these agents than has been the case here. It would have been better if the editors had insisted on all drugs being prescribed in the metric system, with apothecarial equivalents in paren-



theses. The use of centigrams in some sections of the book while technically correct is confusing and should be avoided.

The chapters on pinta and yaws should be consecutive and discussed as treponematoses. Oddly bejel is not mentioned and the authors have avoided the controversy of the relationship of these treponematoses to syphilis. There are excellently written chapters on hygiene and preventive medicine in the tropics and on the adaptations of laboratory and histologic techniques to the tropic. There are also excellent bibliographies appended to each chapter.

The book is too long and too expensive and this latter feature will preclude its purchase by many. It is hoped that future editions will avoid unnecessary repetition, eliminate the description of useless treatments and such subjects as tularmi and tick-bite fever which are not primarily tropical. The latter condition has not appeared south of Brooklyn, New York. Despite the above-mentioned shortcomings the author is to be congratulated for such a successful cooperative effort. This book will be a valuable addition to the library of those who examine military residents of and travelers to and from warm climates. It will undoubtedly be established as one of the standard works on tropical diseases. —*Capt. J. Love MC U S N*

*Food and You*, by *Edmund Sigmond Nas et al.* A B M. S. Ph. D. Prof. of Physiology Department of Physiology and Vital Economics School of Medicine and Dentistry University of Rochester Rochester N Y 92 pages. Charles C Thomas Publisher Springfield, Ill., 1951 Price \$3

Nothing affects a person's well-being so much as the food he eats. This is the sincere belief of the author who has told the story of nutrition simply and concisely. Because of his personal interest in giving factual and nontechnical information as a social nutritional training for his daughters he has made an important contribution to a field of growing interest. This interest now on the upswing has been created by the swelling of the earth's human population and the growing need to feed this population more efficiently. Food being essential to the life of all living beings makes nutrition a strictly personal matter. This book is designed for the easy comprehension of those with no special training in nutrition. Its contents are well-organized. It begins by explaining what food is and what makes it food and proceeds in a logical sequence to food requirements, why each person's requirements vary and how the body prepares each nutrient for its utilization. The nutrients are discussed in detail highlighting the function of each one. Dr. Nas et al. has completed his mission well.

—*Capt. E. M. Girard, MASC, U S A*

# Infectious Mononucleosis Manifested by Diarrhea

Stuart H. Walker Major M.C. U. S. A.

**I**NFECTIONOUS mononucleosis is recognized as a disease of childhood and young adult life with protean manifestations and universal distribution but is considered to be uncommon in the infant and the Negro and rarely manifested by diarrhea. The following case is reported because of the occurrence of this disease in a Negro infant, aged 9 weeks, whose chief symptom was diarrhea.

Bernstein (1), stated that prior to 1940 the youngest observed case had appeared in a 7-month-old infant (2). In an epidemic of infectious mononucleosis encountered in a nursery wherein all patients were less than 2 years of age, no younger case was encountered (3). No reported case of this disease in a patient younger than 7 months was found in a survey of the literature since 1940. Thus, it is believed that this case in a 9-week-old infant is the youngest recorded.

In view of the many infant cases reported in the literature and the nursery epidemic reported by Davis (3) in which 9 of 10 exposed infants contracted infectious mononucleosis, the disease cannot be considered rare in infancy nor can infants be considered less susceptible than older children. Most probably the infrequency with which cases are seen in infancy can be attributed to the lesser opportunity for exposure of this protected age group.

Though Bernstein (1) noted that but one Negro patient with infectious mononucleosis had been reported prior to 1940 he (apparently correctly) assumed that this was the result of infrequent detection rather than infrequent occurrence. In substantiation of this concept, a survey of the literature between 1940 and 1950 by Rathmell et al (4)

(1) Bernstein A. (Baltimore) Infectious mononucleosis. *Medicine* 19: 85-159 F. b. 1940.

(2) Price J. P. Infectious mononucleosis. *Am. J. Dis. Child.* 40: 581-587 Sept. 1930.

(3) Davis, C. M. Acute glandular fever. I. Pfeiffer; report of nursery epidemic. *J.A.M.A.* 92: 1417-1418 Apr. 27 1929.

(4) Rathmell, T. A., Greeley J. P. and Gausser J. R.; Infectious mononucleosis in Negroes; report of case. *Am. J. Clin. Path.* 20: 977-979 Oct. 1950.

revealed 71 reported cases in Negroes. Indeed, Wechsler et al. (5) reported 49 cases in Negroes among 556 cases of infectious mononucleosis on an Army post, an incidence of 8.9 percent, nearly twice the percentage of the Negro population (4.6 percent). These workers believed that this indicated an increased susceptibility to infectious mononucleosis in the Negro. In any case there no longer seems to be any basis for the once common belief that this disease is rare in Negroes.

Infectious mononucleosis is a systemic disease involving the respiratory lymphatic, and reticuloendothelial systems, and the liver in most patients. In addition recent reports have drawn attention to the frequent involvement of the skin with a wide variety of rashes (5) (6), the nervous system chiefly as a lymphocytic meningitis (7-9), or as encephalomyelitis (10-12), the heart as an acute myocarditis (13) (14), and the kidney as an acute nephritis (15). Occasionally severe involvement of the nasal organ system may be manifest as an obstructive pharyngitis (16) or an atypical pneumonia (5) (17) (18), a hypoplastic or hemolytic anemia (6) leukopenia, thrombocytopenia (19-21) with or

(5) Wechsler, H. F. Rosenblatt, A. H. and Sells, C. T. Infectious mononucleosis; report of an epidemic in army post. *Ann. Int. Med.* 25: 115 July-236 Aug. 1946.

(6) Carkle, T., and Blackford, J. M. Infectious mononucleosis with anemia, skin rash, and jaundice. *Northwe. Med.* 41: 137-139 Apr. 1942.

(7) Schmidt, V. and Nyf. Mit, A.. Vber mononucleosis infectiosa und meningorhinitis. *Acta oto-laryng.* 26: 680 1931.

(8) Theilacker, H. E., and Shaw, E. B. Infectious mononucleosis with special reference to cerebral complications. *Am. J. Dis. Child.* 61: 1131-1145 Jan. 1941.

(9) Tidy, H. R. Intermittent of benign lymphocytic meningitis and glandular fever. *Lancet* 2: 819-821, Dec. 7 1946.

(10) Zolman, B. L., and Silverman, E. G. Infectious mononucleosis and encephalomyelitis. *Ann. Int. Med.* 16: 1233-1239 June 1942.

(11) Peters, C. H. Waldman, A. Blumberg, A. and Ricker, W. A. J. Neurologic manifestations of infectious mononucleosis, with special reference to Guillain-Barre syndrome. *Arch. Int. Med.* 90: 366-373 Sept. 1947. Correction 81: 111 Jan. 1948.

(12) Graham, S. D.; Schwartz, W. H. and Chapman, W. L. Infectious mononucleosis complicating infectious mononucleosis. *U. S. Na. M. Bull.* 49: 914-919 Sept.-Oct. 1949.

(13) Jarvik, T. Mononucleosis infectiosa med letald forlo. *Med. med. (Helsingb.)* 14: 1705-1706, June 6, 1942.

(14) Evans, W. F. and Graybiel, A. Electrocardiographic evidence of cardiac complication in infectious mononucleosis. *Am. J. M. Sc.* 211: 220-226, Feb. 1946.

(15) Robbins, M. J. Case of acute infectious mononucleosis complicated by hemorrhagic nephritis. *Hebrew M. J.* 1: 206 1953.

(16) Jones, G. P., and Jones, E. Angioma type of glandular fever requires tracheostomy. *Brit. M. J.* 2: 1212-1213, Nov. 26, 1949.

(17) Redner, M. Case of infectious mononucleosis with atypical pneumonia. *Ann. Int. Med.* 28: 1177-1187 June 1948.

(18) Rapaport, S. L. Infectious mononucleosis, an analysis of 43 cases. *Ann. Vert. Med. & Surg.* 2: 343, 1948.

(19) Goldblum, A. A. and Lieberman, A. Case of infectious mononucleosis with jaundice and thrombocytopenic purpura. *Am. J. Med.* 5: 912-915, Dec. 1948.

(20) Kutzin, M. and Allen, E. G. Infectious mononucleosis and acute thrombocytopenic purpura: report of 2 cases with recovery. *N. York State J. M.* 50: 1131-1132

thout purpura, or panhematopenia (22) or a severe hepatitis with or without jaundice (18) (23) (24). Gastrointestinal involvement has however, been uncommon except as part of a hepatitis or purpura with rectal bleeding (25). Abdominal pain is not uncommon (26) but is considered to be caused by mesenteric lymphadenitis rather than gastrointestinal disease per se.

Review of the literature reveals no mention of infectious mononucleosis manifested chiefly by diarrhea. Bernstein (1) stated that constipation is common while diarrhea is rare. He quoted Pfeiffer (27) as precipitating the frequency of constipation in his original description of this disease. Davis (3) mentioned that some infants in the nursery epidemic had one or two loose stools at the onset of illness. Diarrhea is a common reaction to respiratory infection in infants and that seen in this case may be merely the reaction of this very young infant to a respiratory disease. The case reported does indicate however, that an additional disease state, infectious mononucleosis, may be segregated from the nebulous syndrome of infantile diarrhea.

### CASE REPORT

A 9-week-old infant was entirely well until the onset of rhinorrhea and diarrhea consisting of 3 or 4 loose green stools per day (without gross blood or mucus). No change in the diet or contact with anyone suffering from similar symptoms preceded the appearance of the diarrhea, which gradually increased and was unaffected by tea and paregonic. Fever, slight cough, and the vomiting of a portion of each feeding appeared 1 week after the onset of diarrhea. Labored respirations were noted by the mother on the tenth day of illness. Four to six loose to watery yellow to green stools per day associated with vomiting, rhinitis, and cough persisted until the time of admission on the twelfth day of illness. An older sibling, aged 17 months, developed a mild diarrhea of 5 days duration, shortly after the onset of disease in this patient.

Physical examination at the time of admission revealed a well developed, well nourished, apathetic infant appearing acutely ill but

(21) Aspl. R. M. and Alt, H. L.: Thrombocytopenic purpura complicating infectious mononucleosis; report of case and serial platelet counts during the course of infectious mononucleosis. *Blood* 5: 449, 1950.

(22) Read, J. T. and Helwig, F. C.: Infectious mononucleosis; analysis of 300 cases with 5 characterized by rare hematologic features. *Arch. Int. Med.* 75: 376-380, June 1945.

(23) DeMarrsh, Q. B. and Alt, H. L.: Hepatitis without jaundice in infectious mononucleosis. *Arch. Int. Med.* 80: 257, 1947.

(24) Brown, J. W. and Sims, J. L. et al.: Liver function during infectious mononucleosis. *Am. J. Med.* 6: 321-328, Mar. 1949.

(25) Eckstein, P. and Penney, A. L. P.: Rectal haemorrhage associated with infectious mononucleosis. *Brit. M. J.* 2: 962-963, Oct. 29, 1949.

(26) Sears, H. T. N.: Unusual case of infectious mononucleosis. *Brit. M. J.* 2: 1211-1212, Nov. 26, 1949.

(27) Pfeiffer, E.: *Drüsenfieber*. *Jahrb. f. Kinderh.* 29: 257, 1899.

not dehydrated, with temperature of  $38.2^{\circ}$  C, a heart rate of 160 and a respiratory rate of 34. Slight nasal obstruction and mucoid discharge and slight pharyngeal injection without exudate were noted. The abdomen was distended and tympanitic without spasm or tenderness. The spleen was palpated at the costal margin. Small, shotty nodes 0.5 cm. in diameter were noted in the axillae and in the groins. No other physical abnormalities were noted at any time.

There were 10.5 gm hemoglobin per 100 cc. The red blood cell count was 4.1 million, and the white blood cell count was 6,400 with 80 percent mononuclear and that 28 percent of these were atypical with large indented nuclei and vacuolization of the cytoplasm. Throat cultures revealed diphtheroid bacilli, *Neisseria catarrhalis* and pneumococci on two occasions. Stool specimens were free of red or white blood cells and stool cultures on three occasions revealed no pathogenic organisms (paracolon bacilli were present in each specimen). Heterophile agglutinins were present in a serum dilution of 1:128 (1:256 final dilution with sheep cell suspension) on the sixteenth day of illness. A nucleated blood cell count on the fifteenth day was 5,400 with 4 percent segmented neutrophil, 4 percent unsegmented neutrophils, 2 percent nucleated red blood cells, 6 percent smudge cells, and 84 percent lymphocytes, the majority of which were atypical. On the seventeenth day there were 24 percent segmented neutrophils, 4 percent monocytes, 1 percent eosinophils, and 71 percent lymphocytes, many of which were atypical.

The diarrhea subsided promptly on a skimmed-milk formula after initial subcutaneous administration of fluids. The respiratory symptoms gradually regressed and were not noted after the fifteenth day of illness. A low grade fever between  $37.5^{\circ}$  and  $38.5^{\circ}$  C, continued until the seventeenth day but was not present thereafter. A 2-hour episode of marked respiratory distress with excessive mucus in the pharynx and abdominal distension was relieved by pharyngeal and gastric suction on the fifteenth day and did not recur. No symptom of disease remained at the time of discharge on the seventh hospital day (nineteenth day of illness) though the slight lymphadenopathy and palpable spleen were still detectable.

### SUMMARY

The occurrence of infectious mononucleosis in a 9-week-old Negro infant, believed to be the youngest recorded case is reported. Infectious mononucleosis should be considered in the differential diagnosis of infantile diarrhea, though a review of the literature reveals this to be a rare manifestation of the disease.

# Thrombosis of the Aorta Arising From a Patent Ductus Arteriosus<sup>(1)</sup>

Milton Kurzek *Commander MC, U S N*

Charles V Carlson, *Lieutenant, junior grade MC, U S N R.*

Arthur T Ooghe, *Lieutenant, junior grade MC, U S N R.*

A REVIEW of the literature reveals only a few cases of thrombus formation at the ductus arteriosus and all of these have been in infants. They have manifested themselves by obliterating the lumen of the thoracic aorta or by peripheral embolic phenomena. Bochdalek (2) and Luttich (3) have each described an instance of occlusion of the aorta in an infant by extension of an obliterating thrombus from a ductus arteriosus. Morrison (4) described a case of thrombus extension from a congenital aneurysm of the ductus arteriosus which was closed at the pulmonary end in a 5-day-old boy. This was preceded by otitis media, diarrhea, and dehydration, and was manifested by peripheral embolic phenomena. Gross (5) also described a thrombus extension from a patent ductus in a 17 month-old boy with tetralogy of Fallot. Death in this case was preceded by diarrhea and signs of peripheral embolic phenomena.

## CASE REPORT

A 10-day-old boy was admitted to the hospital on 2 November 1950. The history given described a spontaneous delivery, a birth weight of 7 lb 8 oz., and a normal neonatal course for the first 5 days of life. On the day of admission the infant developed anorexia, watery diarrhea, lethargy and convulsions. The physical examination revealed a de-

(1) From the U. S. Naval Hospital, Oakland, Calif.

(2) Bochdalek. *Vrtyl chr f d. pscht. Hells*, 160-164 1845. Quoted in Welch & H. Embolism. *System of Medicine*. Allbutt C., and Rolleston H. D. 6: 809 1909.

(3) Luttich. *Wien med. Bl.* 1881. Quoted in Welch & H. Embolism. *System of Medicine*. Allbutt C. and Rolleston H. D. 6: 809 1909.

(4) Morrison J. E. Thrombosis of aorta in newborn due to cases on with infection of liver. *J. Path. & Bact.* 57: 221-228, Apr 1945.

(5) Gross R. E. Arterial embolism and thrombosis in infancy. *Am. J. Dis. Child.* 70: 61-73 Aug 1945.

hydrated infant weighing 6 lb. 8 oz. with a rapid pulse and a temperature of 103° F. The eyes were sunken and the scleras injected. The *membranes were dry and the anterior fontanelle was soft and depressed.* The penis and scrotum were cyanotic, edematous, and excoriated. Alternating periods of flaccidity and spasticity of the extremities were noted. These were associated with occasional episodes of twitching. The Chvostek, Brudzinski and Kernig signs were all negative. nuchal rigidity was absent.

Admission laboratory studies revealed a white blood cell count of 12 400 with 1 percent neutrophil 84 percent lymphocytes and 15 percent monocytes; a red blood cell count of 5.4 million; and hemoglobin of 15.5 grams. The CO<sub>2</sub> combining power was 66 volumes per 100 cc., and the blood chloride level was 480 mg. per 100 cc. The patient was given 100 000 units of penicillin every 8 hours 50 mg. of streptomycin every 8 hours oxygen inhalations, and 150 cc. Hartman's solution with 175 cc. of 5 percent dextrose in water intravenously. Ten hours after admission his hydration was improved and above the umbilicus the skin appeared pink, but the skin of the lower trunk and legs was cool and cyanotic. The femoral arterial pulsations were absent. The tendon reflexes were absent in the lower extremities and activity of the legs was diminished. The clinical impression was saddle thrombosis arising by retrograde extension from the genital region.

At that time the CO<sub>2</sub> combining power was 44 volumes per 100 cc., the blood chloride level was 350 mg. per 100 cc. and the nonprotein nitrogen was 24.5 mg. per 100 cc. The white blood cell count was 19 750 with 24 percent neutrophils, 72 percent lymphocytes and 4 percent monocytes; the red blood cell count was 4.62 million, and the hemoglobin was 14 grams. Eighteen hours after admission a sharply defined line of cyanotic demarcation had developed pink above the umbilical level and moderately cyanotic below. An hour later preceded briefly by general cyanosis the infant suddenly died.

*Autopsy findings* The subject was a well-developed white male infant, about 11 days old, weighing 2,850 grams. There was no rigor mortis. There was livor mortis over the entire body except below the inguinal ligaments where the skin was pale. The cord was almost completely healed. A maximum of thin purulent material was present about the circumcisional scar. A patent ductus arteriosus was present. An organized pale thrombus extended from the opening of the ductus down the aorta to 1 cm. above the diaphragm (fig. 1). This appeared completely to occlude the aorta. Adherent to the caudate end of the thrombus was a thin tail of postmortem clot. The endocardium appeared smooth and glistening. The round ligament contained a small fresh thrombus with no evidence of inflammation. The remnants of the hypogastric arteries also contained fresh thrombi. The rest of the blood vessels were perfectly clear. The penis revealed a subcuticular

On microscopic examination the heart tissue was normal. The aorta contained a well formed thrombus fixed to the endothelium beginning in the ductus arteriosus and extending a distance of 4 cm. down the aorta. Inflammatory reaction was lacking. The hypogastric vessels showed marked narrowing of their lumens by fibroblastic proliferation and a recent thrombus occluded the lumen of the artery. Degenerative changes were present in the muscle fibers. The lungs showed intense vascular congestion. The alveolar septums were thickened and compression atelectasis was evident. Numerous alveolar spaces contained precipitated albuminous material (edema fluid) and extravasated red blood cells. Sections of the brain showed pericellular vacuoles in



Figure 1 Thrombus in aortic arch.

the basal ganglia, pons and frontal cortex. In the basal ganglia there was an area showing marked vacuolization of the ground substance and chromatolytic changes in the nerve cells. All the blood vessels were dilated and engorged with red blood cells. The other organs showed marked congestion.

The pathologic diagnosis was (1) thrombosis massive ductus arteriosus and thoracic aorta, and (2) congestion of lungs, liver spleen kidneys, and brain with pulmonary and cerebral edema.

#### DISCUSSION

In the two cases in which a clinical description was obtained (4, 5) diarrhea and dehydration were present as in this case. The resulting hemoconcentration and slowing of the blood stream may have played a role in the formation of the thrombus. Other contributing factors were the eddy currents and retardation of the blood flow through the ductus arteriosus. Other possible factors in thrombus formation at the site of the ductus arteriosus are congenital heart disease, trauma to the intima, neonatal polycythemia, and sepsis with endarteritis and myocarditis. Some of these factors may decrease cardiac output and rate of blood flow.



Preliminary reports (6) state that penicillin produces hypercoagulability but the evidence at present is insufficient to warrant any anticoagulant measures being taken (7). Gradual obliteration of a large vessel is characterized by early intermittent claudication and disturbance of sensation and circulation. Numbness, formication, coldness, pallor, cyanosis, and gangrene with severe pain develop from this abnormality. The tendon reflexes vary in their response. Paraplegia may ensue when the arterial pulsations are diminished or absent.

If the diagnosis can be made the therapy should be conservative management with anticoagulants to inhibit further extension of thrombus. This may aid in the development of an adequate collateral circulation. Surgical measures are difficult to apply because of inability to localize the site of thrombosis. An aortic resection or thrombectomy in such a closely confined and vital area is a formidable procedure.

(6) Moldavsky, L. F., Hasselbrock, W. B., and Catano, C.: *Studies in mechanism of penicillin action. Penicillin effects on blood coagulation*. Science 102: 38-40, July 13, 1945.

(7) Coe Griffith, S. W.: *Present status of problem of thrombo-embolism*. Am. J. Med. 3: 740-752, Dec. 1947.

## BOOK REVIEW

Ophthalmology by Arno E. Towne, M. D., Professor of Ophthalmology, Jefferson Medical College of Philadelphia. 511 pages, 208 illustrations and 4 colored plates. Lea & Febiger, Philadelphia, Pa., publishers, 1951. Price \$10.

This is an excellent book written for the student and general practitioner and is well supplied with references for more detailed discussions on the various subjects. It is concise and clear and begins with the external examination of the eye going on to an excellent discussion of the use of the ophthalmoscope and slit lamp. Seventy-five pages are devoted to the physiology of vision. The anatomy and embryology of the eye and orbit are concisely yet adequately discussed. Inflammations, tumors and dyscrasias of the eye and adnexa are discussed together with their treatment. The chapter on glaucoma includes classification, diagnosis and treatment with well labeled diagrams. The final chapter devoted to surgery contains illustrations which give an excellent step-by-step picture of each procedure. The author aided by 11 contributors has produced a valuable text.

—Commander E. Kukrycki, MC, U. S. N.

# Artificial Pneumothorax in Pulmonary Tuberculosis<sup>(1)</sup>

Richard E. Mardis, *Major MC, U S A.* (2)

Ray G Cowley *Major MC, U S A.* (1)

THE prominent place of artificial intrapleural pneumothorax in the treatment of pulmonary tuberculosis so long apparently secure has recently shown evidence of being supplanted by other measures. With the decline in the use of pneumothorax there has been a corresponding increase in the use of pneumoperitoneum at this and other hospitals as related to the total number of both procedures (fig 1). Credit for the first clinical use of artificial pneumothorax has been given to Forlanni who in 1888 induced pneumothorax in a patient with pleural effusion and who in 1892 gave it in treatment of pulmonary tuberculosis. Murphy a surgeon helped establish the value of pneumothorax in this country (3) but its failure to gain widespread recognition is evidenced by the fact that a book on diseases of the lungs (4) published in 1907 makes no mention of it. The subsequent gradual rise in the use of pneumothorax was largely related to the availability of roentgenographic facilities and the period from the early 1920's to the early 1940's saw pneumothorax used widely and frequently (5, 6).

Various opinions have been expressed in the literature concerning the value of artificial pneumothorax, particularly in recent years. Cohen (6) states that "artificial pneumothorax is still the best single treatment procedure in tuberculosis in carefully selected cases properly administered." Hayes (7) reports in a survey of leading chest

(1) From the Fitzsimons Army Hospital Denver, Colo.

(2) Transferred to Tripler Army Hospital Honolulu, T. H.

(3) Gordon, B. Indications for and technical of artificial pneumothorax. *M. Clin. North America* 21: 1193-1209 July 1937.

(4) Babcock, R. H. Diseases of the Lungs. Appleton and Co., New York, N. Y., 1907.

(5) Hay, J. V. Present status of therapeutic pneumothorax. *Am. Rev. Tuberc.* 62: 1-15 90-97 July 1950.

(6) Cohen, A. J. Forty years experience with artificial pneumothorax. *Dis. Chest* 17: 74-83, J. A. 1950.

(7) Hay, J. E. W. Abstract (reply to question) on intrapleural artificial pneumothorax. *Dis. Chest* 15: 770, 1947.

specialists that pneumothorax is used in from 4 to 100 percent of the patients with pulmonary tuberculosis coming under their care but that in general there has been a trend away from pneumothorax. This decline in pneumothorax has been ascribed to the high percentage of serious complications, and to the fact that recent developments in the management of tuberculosis (potamoperitoneum chemotherapy excisional surgery) have lessened the acute need for this hazardous procedure (5, 8). Our purpose in this article is to review in detail a series of patients treated with pneumothorax, to outline contraindications to

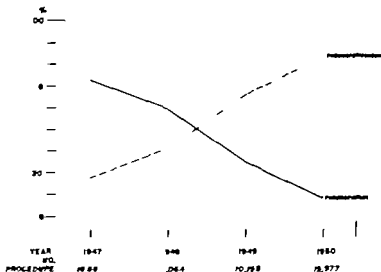


Figure 1. Percent of pneumothorax and of potamoperitoneum treatments performed at Fitzsimons Army Hospital, 1947-50, based on total of both.

and indications for this procedure to evaluate the use of streptomycin (SM) in patients treated with pneumothorax and to offer an explanation of the growing decline in the use of this treatment.

### CLINICAL MATERIAL AND METHODS OF EVALUATION

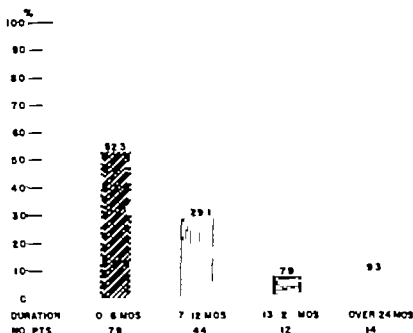
A total of 151 patients with pulmonary tuberculosis hospitalized at the hospital in 1948 and to whom artificial pneumothorax was given at some time during their treatment are included in this report. They were chosen from the records on file which included those of all patients discharged from the hospital by reason of transfer, maximum hospital benefit, death, or irregular discharge during the entire year of 1948. No selection was made except to exclude a few patients with insufficient data for analysis. The year 1948 had the following advantages regarding the study of pneumothorax: (1) relatively large number of pneumothoraces were performed, (2) the number of patients receiving SM and not receiving SM was about equal. Prior to 1948 few

(8) Strag, H. L., and Shephard, R. M.: Complications of pneumothorax and peritonitis. *Dis. Chest* 19: 78-91, Jan. 1951.

patients except those seriously ill or on special study projects received SM and since 1949 nearly all patients receiving temporary collapse have also had chemotherapy.

The patients were predominantly young white (86.8 percent) men (92.7 percent) whose ages ranged from 18 to 60 years with 64.9 percent under 30 and 89.4 percent under 40. No instances of minimal tuberculosis were encountered. Ninety-six (63.6 percent) were moderately advanced and the remainder were far advanced. Cavitation was present in 137 (90.7 percent). Tubercle bacilli were demonstrated by smear or by culture of the sputum or gastric contents in nearly all of the patients at the onset of hospitalization but at the time pneumothorax was induced 117 (77.5 percent) were positive, 32 (21.2 percent) were negative and the remaining 2 were unknown. Of the 32 cases with negative sputum before pneumothorax, 23 (71.9 percent) had been treated with SM.

The duration of disease prior to induction of pneumothorax is shown in figure 2, which indicates that in most patients the disease was of less than 1 year's duration.



Based on total number of patients.

Figure 2. Patients grouped according to duration of disease at the time of induction of pneumothorax.

The patients were divided into clinical-pathologic types based on roentgenographic trend and duration of disease as shown in table 1. Nontuberculous complications of the disease were recorded when present. Only 6.6 percent of all patients had such complications and none of these were of a nature to affect seriously the trend of the tuberculosis nor the outcome of pneumothorax treatment.

TABLE 1 *Distribution of patients by clinical pathology type*

Type (D)	Number of patients	Percent
I	19	12.5
II and III	75	49.7
IV and V	35	23.2
Unknown	22	14.6
Total	151	100.0

(1) Type: I = New soft resolving (exudative); II = New soft poorly resolving (caseous); III = Mixed new lesions of types I and II; IV = Old hard poorly resolving (fibre cavernous); V = Mixed old and new

Streptomycin was given before and/or during pneumothorax treatment in 90 (59.6 percent) of the patients. The other 61 either had no SM or SM was given only after pneumothorax was abandoned. At the time these patients were treated SM alone was being given intramuscularly each day to most. A few received SM every 3 days and several were given SM by aerosol inhalation. The duration of SM therapy varied in individual cases but the predominant regimen at that time (1948 and previously) called for 120 days of continuous therapy. No attempt was made to select patients according to the SM regimen used, but all patients have been grouped according to the time relationship of SM therapy to pneumothorax (table 2).

TABLE 2 *Time relationship of SM therapy to pneumothorax*

Groups according to SM therapy	Number of patients	Percent	
No SM before or during pneumothorax	61	40.4	} Total number of patients whose pneumothorax could have been influenced by SM 90 (59.6%)
SM before pneumothorax only	41	27.1	
SM during pneumothorax only	24	15.9	
SM both before and during pneumothorax	75	49.6	
Total	151	100.0	

Various factors such as temperature at onset of pneumothorax, complications of treatment, and additional operative procedures were taken from the available clinical records and correlated whenever possible with the outcome of pneumothorax treatment. Serial roentgenograms of nearly all patients were available and in the rare case with no roentgenogram the descriptions available in the clinical records were used. After thorough study of all records each patient was placed

in 1 of the 3 following categories in respect to the outcome or trend of the pneumothorax treatment.

1 *Successful* Pneumothorax was considered successful if all of the following criteria were met: (a) anatomically adequate collapse of the diseased lung (b) follow-up period of more than 3 months (c) either roentgenographic clearing or stability with small inactive-appearing residuals of disease (d) apparent cavity closure (e) sputum conversion to negative for 3 months or more (f) general condition of patient satisfactory and (g) no serious complications of such a nature as to make the ultimate prognosis poor.

2 *Failure* Pneumothorax was considered a failure if any of the following conditions existed: (a) inadequate collapse of the diseased lung caused by pleural symphysis or by adhesions not amenable to pneumonolysis (b) abandonment of pneumothorax if for reasons of complications of the treatment or of the disease (c) failure to convert the sputum or to close cavities in patients with 6 months or more follow-up after induction of pneumothorax, (d) unfavorable clinical or roentgenographic trend (e) the necessity of adding other operative procedures excluding pneumonolysis to control the disease or (f) failure to control both lungs with bilateral pneumothorax.

3 *Indeterminate* The results of pneumothorax treatment were called indeterminate in patients who had less than 6 months follow-up in whom the general trend was favorable but who did not meet the requirements set up for successful pneumothorax.

TABLE 3 *Duration of pneumothorax therapy*

Duration (months)	Number of patient			Total
	Successful	Failure	Indeterminate	
Less than 1	0	23	—	23
2 to 6	0	16	1 (AVOL.)	17
7 to 12	5	10	—	15
13 to 24	3	2	—	5
25 to 48	1	3	—	4
Over 48	1	1	—	2
Total number of patients when pneumothorax was discontinued	10	55	1	66
Number in whom pneumothorax was continued when patient was lost to study	51(1)	10(2)	24	85
Total	61	65	25	151

(1) Average duration of pneumothorax in successful group when lost to study, 13.3 months.

(2) Average duration of pneumothorax in failure group when lost to study, 13.2 months.

The follow-up period (from induction of pneumothorax until the patient was lost to the study) was from 1 month to 20 years. The average duration of follow-up was 20.6 months for patients designated successful or failure and less than 6 months for those called indeterminate. Of all the patients 68.8 percent had follow-up periods of from 3 to 24 months.

Artificial pneumothorax administered to the patients in this study was of the negative pressure type with the degree of collapse varying from 15 to 50 percent in most. The duration of pneumothorax treatment varied from immediate abandonment in many of the failure group to an average of 13.2 months in the successful group when they were lost to this study. Table 3 shows this breakdown in detail. Few cases receiving satisfactory pneumothorax were subjected to therapeutic re-expansion within the time limits for follow-up achieved in this study but most of the failure group had abandonment of pneumothorax relatively early.

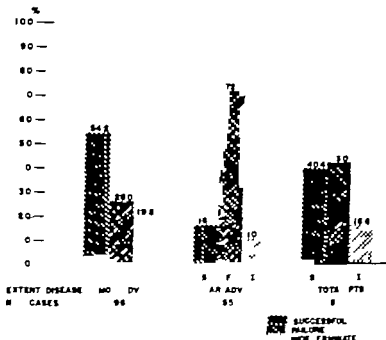


Fig. 3. Results of pneumothorax treatment related to extent of disease.

### EVALUATION OF RESULTS

The general results of the pneumothorax therapy as previously defined were correlated with the extent of disease (fig. 3), location of ca. ration (fig. 4), the clinical pathologic types (table 4) duration of disease (fig. 5), temperature & time of induction of pneumothorax

TABLE 4 *Results of pneumothorax treatment related to clinical pathologic types*

Clinical pathologic type (1)	Total		Results					
			Successful			Failure		
	Number	Percent	Number	Percent	Number	Number	Percent	Indeterminate Percent
I	19	100	11	57.9	5	26.3	3	15.8
II and III	75	100	26	34.7	35	46.7	14	18.7
IV and V	35	100	12	34.3	15	42.9	8	22.9
Unknown	22	100	12	54.5	10	45.6	0	0.0
Total	151	100	61	40.4	65	43.0	25	16.6

(1) See table 1 for definition of types.



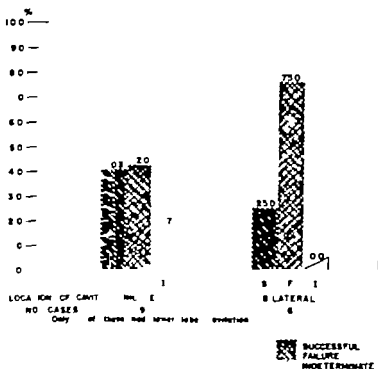


Figure 4. Results of pneumothorax treatment related to location of cavities.

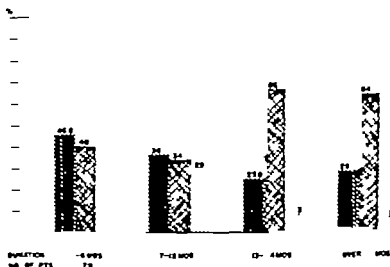


Figure 5. Results of pneumothorax treatment related to duration of disease at time of selection of pneumothorax.

(table 5) and with SM therapy (table 6). The incidence of complications of pneumothorax and their relation to success or failure of the treatment was also determined. As shown in figure 3 the percent of successful pneumothoraces was very low in the patients with far advanced tuberculosis. Aycock and Feller (9) reported 86 percent success and 14 percent failure in the moderately advanced group with 44.5 percent success and 55.5 percent failure in the far advanced group. When cavities were unilateral (fig. 4) the proportion of successful cases to failures were nearly equal as it was in the entire series but in the 16 patients with bilateral cavitation the ratio of success to failure was 1:3. Lower lobe cavitation was considered a strong contraindication to the use of pneumothorax at the time these patients were treated. Only 6 patients with lower lobe cavities were found in this series and the results in these were not sufficiently disparate to warrant reporting them separately. Poor results in lower lobe disease have been reported by others (10).

When the outcome of pneumothorax was related to the clinical pathologic types the most significant finding was the higher percent of successful results and correspondingly lower incidence of failures in type I. There was little to be noted from the results in the other types the percentage of failures being somewhat higher than that of the successes. That type I patients responded better than the other groups is not surprising as this form of tuberculosis characteristically does well with bed rest alone or with drug treatment.

There appears to be a significant relationship between the success or failure of pneumothorax and the duration of the disease at the time this treatment was started. As shown in figure 5 when the disease was of less than 13 months duration the results were slightly better than those for the entire series (fig. 3) but when the disease has been present for over 1 year failures outnumbered successful results about 2:5:1.

The danger of administering artificial pneumothorax to patients with acute febrile caseo-pneumonic disease has been recognized for many years. In the past when pneumothorax was considered nearly indispensable in the armamentarium of therapy induction was occasionally attempted in such patients in the hope that the pneumothorax would do more good than harm. Very few patients of the 131 in this group were febrile but table 5 shows that pneumothorax in most of these few ended in failure.

In order to have a guide to judge results of pneumothorax as related to SM therapy each group as outlined in table 2 was further divided according to extent of disease (table 6). The ratio of moderate to far ad-

(9) Aycock, G. F. and Klier, P. E.: Result of artificial pneumothorax; review of 530 cases. *Am. Rev. Tuberc.* 38: 277-291, Sept. 1938.

(10) Roksteln, L.: Poor results with artificial pneumothorax in lower lobe tuberculosis. *Am. Rev. Tuberc.* 59: 30-34, Jan. 1949.

TABLE 5. *R. solis* / pneumothorax treatment related to temperature at Larr / pneumothorax

Temperature	Total			Success			Results			Indeterminate		
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Unknown	49	100	22	44.9	27	55.1	0	0.0	0	0.0	0	0.0
Normal	90	100	37	41.1	32	35.6	21	23.3	21	23.3	21	23.3
99 to 100 F	10	100	2	20.0	4	40.0	4	40.0	4	40.0	4	40.0
100 to 101 F	1	100	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
Over 101 F	1	100	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
Total	151	100	61	40.4	65	43.0	25	16.6	25	16.6	25	16.6

TABLE 6. *Results of pneumothorax related to SM therapy*

Group according to SM therapy	Extent of disease				Total				Results			
	Moderately advanced		Far advanced						Successful		Failure	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
No SM before or during pneumothorax	40	65.6	21	34.4	61	100	30	49.2	28	45.9	3	4.9
SM before pneumothorax only	27	65.9	14	34.1	41	100	8	19.5	17	41.5	16	39.0
SM during pneumothorax only	12	50.0	12	50.0	24	100	10	41.7	14	58.3	0	0.0
SM before and during pneumothorax	17	68.0	8	32.0	25	100	13	52.0	6	24.0	6	24.0
Total	96	63.6	55	36.4	151	100	61	40.4	65	43.0	25	16.6

vanced disease was essentially the same in all groups except for the relatively higher proportion of far-advanced disease in the group receiving SM during pneumothorax only. The greatest percent of successes was in the group receiving SM both before and during pneumothorax therapy.

Streptomycin therapy has been greatly modified since 1948 (11). With the newer regimen in which intermittent doses of SM are combined with para-aminosalicylic acid as with the older regimens have found it advantageous to treat patients with drug for from 30 to 90 days prior to temporary collapse procedures when indicated and to continue drug treatment for a total of at least 120 days.

TABLE 7 *Completion of pneumothorax related to success or failure of treatment*

Completion	Total		Number of patients		
	Number	Percent	Success	Failure	Indeterminate
Adequate only	57	37.7	15	32	10
Pleural effusion plus adhesion	22	14.5	11	9	2
Tension cavity (with adhesion and/or effusion)	15	9.9	3	12*	0
Pleural effusion only	12	7.9	8	2	2
Fibrothorax	4	2.6	2	2*	0
Empyema	2	1.3	0	2†	0
Obliterative pleuritis	2	1.3	1	1	0
Air embolism	2 <sup>‡</sup>	1.3	0	2	0
Atelectasis	1	0.7	0	1	0
Subtotal	115	76.2	40	61	14
No complications	33	21.8	20	2	11
Unknowns	3	2.0	1	2	0
Total	151	100.0	61	65	25

Also had adhesions.

\*All but one also had adhesions; 5 had effusion.

†One with adhesions; one with effusion.

‡Died.

One died, both had adhesions also and are included in that group.

(11) Tempel C. W., et al. Combined intermittent regimen employs streptomycin and para-aminosalicylic acid in treatment of pulmonary tuberculosis; comparison with daily and intermittent dosage schedules. *Am. Rev. Tuberc.* 63: 295-311 Mar. 1951.

## COMPLICATIONS OF ARTIFICIAL PNEUMOTHORAX

The complications of pneumothorax encountered in this series were frequent and varied. The most common complication was intrapleural adhesions occurring in 94 (62.2 percent) patients and many times associated with other complications. The next most frequent complication was pleural effusion of all degrees occurring in 40 (26.5 percent). These also were usually associated with other complications. A breakdown of the various complications is shown in table 7 with the results of pneumothorax. It appears from the table that with the possible exception of slight pleural effusion only the presence of the complications decreases the probability of successful pneumothorax. SM was given during pneumothorax to 8 of the 15 patients who developed a tension cavity with 3 successful results and 5 failures. Patients the duration of whose disease was 6 months or less were analyzed according to the percent with adhesions found on induction of pneumothorax as related to whether SM was given prior to pneumothorax or not. The results of this analysis are shown in table 8. Giving SM prior to pneumothorax in patients whose disease was of short duration resulted in a significantly lower incidence of pleural adhesions. Pneumonolysis was attempted in 27 patients (28.7 percent of the 94 with adhesions). Sixteen of the 27 pneumonolyses were successful in that the adhesions could be severed but not all the successful pneumonolyses resulted in successful pneumothoraces. Pneumoperitoneum was added in the treatment of 18, thoracoplasty in 16 and lobectomy was performed on only 1 patient.

TABLE 8. *The effect of prior SM therapy on the presence of adhesions in diseases of 6 months or less duration at time of pneumothorax*

	Total		Adhesion		No adhesion	
	Number	Percent	Number	Percent	Number	Percent
SM before pneumothorax	17	100	7	41.2	10	58.8
No SM before pneumothorax	52	100	33	63.5	19	36.5
Total	69	100	40	58.0	29	42.0

## DISCUSSION

At this hospital the following contraindications to the use of artificial pneumothorax in the treatment of pulmonary tuberculosis have served as a guide for several years: (1) active endobronchial tuberculosis or bronchial stenosis because of the danger of blocked drainage atelectasis or tension cavities (2) acute tuberculous pneumonia because of the danger of empyema massive atelectasis and early

spread of the disease (3) extensive bilateral disease; (4) tuberculosis with a large nodular component (tuberculomata, or large fibro-casconodose lesions); (5) extensive fibro-cavernous lesions because of the likelihood of pleural symphyses, inexpandible lung and the mechanical difficulty of closing such cavernous lesions by pneumothorax (6) large peripherally located or lower lobe cavities (7) tuberculosis of the pleura (8) massive atelectasis (9) concomitant disease of the chest such as asthma, severe emphysema, and congestive heart failure and (10) the presence of other nontuberculous disease the nature and extent of which make operation on the chest impossible. These contraindications have been accepted fairly widely (3, 5, 6, 9, 10).

TABLE 9 *The relation of certain contraindications\* to the success or failure of artificial pneumothorax treatment*

Contraindications	Total		Results			
	Number	Percent	Number	Percent	Number	Percent
None	60	100	42	70.0	18	30.0
One contraindication	42	100	16	38.1	26	61.9
Two or more contraindications	24	100	3	12.5	21	87.5
Total	126	100	61	48.4	65	51.6

\*The contraindication considered in this table are: (1) far advanced disease; (2) bilateral cavitation; (3) disease over 1 year's duration; and (4) elevation of temperature over 99° F.

The foregoing evaluation of results suggests several relative contraindications to the use of artificial pneumothorax in that failure of the procedure is much more frequent than success when these conditions prevail. These relative contraindications are (1) far advanced pulmonary tuberculosis (2) the presence of bilateral cavitation (3) duration of disease over 12 months at the time of induction of pneumothorax; and (4) temperature of the patient in excess of 99° F immediately prior to starting pneumothorax therapy. The significance of these 4 conditions is borne out in their statistical relationship to the success or failure of pneumothorax treatment as shown in table 9.

Because the successful management of pulmonary tuberculosis no longer depends on artificial pneumothorax so much as formerly it seems wisest to attempt the procedure only in the absence of any of the contraindications listed in the first or second paragraphs of the discussion, and only in the presence of moderately advanced active tuberculosis with unilateral upper lobe cavitation. The apparent cavity

closure or the sputum conversion which may frequently be observed during chemotherapy should not induce a false sense of security. Roentgenographic and sputum relapse are not uncommon in these patients following completion of drug treatment (11) and temporary collapse measures are usually indicated to maintain and to further the gains of the rest and drug regimens.

The reasons for the growing decline in the use of artificial pneumothorax may be summarized as follows: (1) pneumothorax is a dangerous procedure from the standpoint of both early and late complications; (2) the contraindications to the use of pneumothorax are numerous; (3) with the increased use of other temporary and permanent operative procedures the need for pneumothorax in the management of tuberculosis has diminished; and (4) streptomycin and other tuberculostatic drugs have decreased the necessity for temporary collapse measures.

### SUMMARY

Artificial intrapleural pneumothorax in the treatment of pulmonary tuberculosis which enjoyed widest usage from the early 1920's to the early 1940's has recently shown a decrease in popularity. In an evaluation of 151 patients with pulmonary tuberculosis who received artificial pneumothorax treatment it was found that: (1) streptomycin was given to 59.6 percent; (2) the results of treatment in the entire series were successful in 40.4 percent, unsuccessful in 43 percent, and indeterminate in 16.6 percent; (3) only 16.4 percent of the patients having far-advanced disease had successful pneumothoraces; (4) bilateral cavitation was accompanied by failure of treatment with pneumothorax in 75 percent of such patients; (5) of all clinical pathologic types, new soft resolving disease (exudative) responded best to pneumothorax; (6) failure of treatment with pneumothorax occurred in two-thirds of all patients whose disease was of over 1 year's duration at the time pneumothorax was started; (7) fever at time of induction of pneumothorax was associated with a large proportion of treatment failures; (8) best results were obtained in the group receiving streptomycin both before and during pneumothorax therapy; (9) complications of pneumothorax treatment were frequent and varied; (10) the presence of complications was associated with a low percent of successful pneumothoraces; and (11) the following relative contraindications were added to the list of contraindications previously accepted: (a) far advanced disease; (b) bilateral cavitation; (c) tuberculosis of over 1 year's duration; and (d) elevation of temperature over 99° F. at the time of starting pneumothorax.

The value of artificial pneumothorax is still acknowledged for the limited number of patients with pulmonary tuberculosis in whom the indications for this procedure exist without detectable contraindications.



## BOOK REVIEW

Report to the Combined Chief of Staff, by the Supreme Allied Commander South-East Asia 1943-1945. Vice-Admiral The Earl Mountbatten of Burma, K. G., P. C., G. C. S. I., G. C. V. O., K. C. B., D. S. O. 280 pages; illustrated. Philosophical Library New York N. Y. publisher, 1951. Price \$12.

Careful study of the report reveals no mention of the employment of the Medical Department in any given campaign. The general picture as given in Annexure 5 concerns for the most part the function of a very high-level group and contains little of value to the medical officer who is charged with actual casualty care. The activities of the Medical Advisory Group as related in Annexure 5 appear in many ways to duplicate the normally assumed duties of the senior medical officers in the various high-level staffs.

The reduction in sickness rate cited in this report which tacitly implies a high degree of the effectiveness of preventive measures does not take into consideration the possibility that the nature of the campaigns conducted in 1945 led to less exposure to disease because of a more stabilized situation. Furthermore the premise expressed under discussion of tropical disease in paragraph 60 and page 15 that our forces would take advantage of the worst conditions to the end that the Japanese would suffer more is not a valid one. It has never been policy of this country to accept increased casualties whether battle or nonbattle if there was any way of avoiding them. It is doubtful that the assistance of our troops to tropical disease would enable them to fare better than the Japanese troops who had been operating in the tropics for a longer period regardless of any preventive measures used by our own men.

This manuscript contains little of value to the Medical Department and in glossing over the tremendous problems involved in care and evacuation of battle casualties and the great loss of efficiency of the fighting elements caused by disease it actually performs disservice to the Medical Department. I realize that this is a military operations report but I believe that in touching so lightly on the Medical Department participation, an opportunity for a real contribution to the conduct of jungle operations has been lost.

—Capt. E. R. Herring MC U S A.

# Acute Porphyria With Intestinal Carcinoma<sup>(1)</sup>

Charl D Chaput Lieutenant, MC, U S N. R.

Joseph J Timmo Commander MC, U S N

SINCE Günther (2,3) in 1911 first described hematoporphyrin following Hoppe-Seyler's clear description of a porphyrin many articles on porphyria have appeared. In some of these (4-10) the abdominal symptoms characterized by cramps distention and constipation have been stressed and it has been further pointed out that these signs and symptoms are caused by spasm in segments of the gastrointestinal tract. It has also been shown that unnecessary laparotomies had been performed on patients with this disease because of a mistaken preoperative diagnosis. The following case is reported because a malignant lesion of the gastrointestinal tract was found in association with acute porphyria. Because of the emphasis in the literature on spasm as a cause for the abdominal symptoms in acute porphyria radical surgical therapy was considerably delayed. In addition the case is also of interest because of the possible relationship between carcinoma and acute porphyria.

## CASE REPORT

A 35-year-old woman was admitted to this hospital on 16 February 1951 complaining of abdominal pain and constipation. Two months

(1) U. S. Naval Hospital Newport R. I.

(2) Gauthier H. De Hematoporphyrin. Deutsches Arch. f. klin. Med. 89 1911

(3) Günther H. Hematoporphyrin. In Schittenhelm, A. (editor): Enzyklopädie der innere Medizin. Handbuch der Krankheiten des Blut und der blutbildenden Organe. V. Jena II. Julius Springer Berlin, 1925. p. 622.

(4) Chandler F. G. et al: Clinical porphyria, with report of case of cutaneous type. Brit. M. J. 2: 1173-1180 Dec 16, 1939.

(5) Fullerton R. H.: Acute porphyria. U. S. Armed Force M. J. 1: 214-217 Feb. 1950.

(6) Gilman, D. L.: Review of porphyria. Papers of the Hosp. Clinic Urbana, Ill. 3: 35-40 1950.

(7) Goldman A. M. and Kaplan, M. H.: Acute porphyria. Ann. Int. Med. 34: 415-427 Feb. 1951.

(8) Porphyria. Bull. Linn. Minnesota Hosp. 22: 1950.

(9) Purdie E.: Case of cut. porphyria. Brit. M. J. 1: 926-929 May 15 1948.

(10) Prantky F. T. G.: Acute porphyria: investigations on pathology of porphyria and identification of excretion of uroporphyrin. I. Arch. Int. Med. 77: 623-642 June 1946.

prior to admission she first noted constipation which had gradually increased in severity. At the onset of the constipation she was able to move her bowels with the aid of mild laxatives but gradually laxative or enemas had no effect. On the day preceding her admission to the hospital she noted a constant desire to move her bowels without success and for the first time passed a small amount of dark red blood per rectum. During the previous month she had noted a gradual onset of lower abdominal cramps which had progressively increased in severity. Over a 10-year period she had gradually lost 30 pounds.

Physical examination on admission revealed a poorly nourished woman in acute distress with a temperature of 98.8 F., a pulse rate of 108 and a respiratory rate of 24. Her abdomen was distended and tympanic throughout. Only occasional faint peristaltic waves were audible. Tenderness was present in both lower quadrants of the abdomen without muscle guarding. The leukocyte count on admission was 24,100 with 88 percent neutrophils. A roentgenogram of the abdomen revealed moderate distention of the colon with gas. A urine specimen voided on admission was noted to be cherry red and, when examined by the Watson-Schwartz method, was found to be positive for porphobilinogen. Later on the first hospital day the patient again voided cherry-red urine which was again positive for porphobilinogen. On the basis of the above findings a diagnosis of acute porphyria was made. Accordingly she was treated conservatively with a soft diet, vitamins and demerol hydrochloride (meperidine hydrochloride) for abdominal pains. During the first 5 hospital days all urine specimens were positive for porphobilinogen but repeated examinations of the urine thereafter failed to reveal the presence of this substance.

During the first 7 hospital days the patient's abdomen gradually became more distended. She was able to pass small amounts of flatus per rectum during the first few days. On the seventh hospital day the abdominal cramps became severe, flatus was no longer passed per rectum, and she began to vomit. A roentgenogram of the abdomen on this day revealed marked distention of the colon exclusive of the sigmoid and rectum. A sigmoidoscope was passed a distance of 25 cm. and failed to reveal the presence of an organic lesion.

On 23 February a cecostomy was performed without exploration of the rest of the abdomen as it was feared that the tremendously dilated cecum might become perforated. Following cecostomy the patient felt much better although she continued to have abdominal pain and backache. She also passed some flatus and an occasional small stool per rectum. A barium enema was obtained and although the patient was unable to retain the fluid very well, the barium passed to the mid-descending colon without apparent obstruction. The patient's abdomen became soft when all distention was relieved and large amounts of liquid fecal matter passed through the cecostomy stoma. When the cecostomy did not function well the abdomen became distended and the abdominal cramps and backache became more severe.

On 12 April barium was injected through the cecostomy tube and a completely obstructing lesion of the proximal descending colon was demonstrated with irregularity of the mucosa suggestive of adenocarcinoma of the colon. The patient was then prepared for operation with the administration of 1500 cc of whole blood and the use of bowel antiseptics. An exploratory laparotomy revealed a firm, nodular mass 8 cm. long in the proximal descending colon involving the entire circumference of the bowel with extension through the serosa. There were also numerous seedlike transplants throughout the entire peritoneal cavity involving the serosa of the intestines, the parietal peritoneum, and the omentum. Microscopic examination of one of the omental masses proved it to be an adenocarcinoma. Because the lesion was beyond hope of surgical cure a palliative transverse colostomy was performed. In spite of the presence of acute porphyria it is noteworthy that the patient withstood the surgical procedures well. Postoperatively her course was gradually downhill and she died on 16 May. Permission for an autopsy was not granted.

### DISCUSSION

Acute porphyria is a metabolic disease and as with any other metabolic disease it may be associated with some other organic pathologic process. Although spasm of the gastrointestinal tract is usually the cause of abdominal symptoms in acute porphyria the abdominal complaints have a separate and distinct cause as in the case presented. In general operation is to be avoided when porphyria is present because these patients do not tolerate surgical procedures or anesthesia well but when an operation is definitely indicated it should be performed and as in the case presented may be tolerated quite well. Although we are unable to find any similar cases reported in the literature it is probable that others too may overlook another organic lesion associated with porphyria.

This case is also of interest because of the possible relationship between porphyria and carcinoma. Although the relationship between the two conditions is not well understood a number of experiments have been performed which suggest that such a relationship may exist. Figge (11) and other observers (12, 13) have noted red fluorescence of the harderian glands of mammary-cancer-susceptible mice which did not exist in mammary-cancer-resistant mice. This red fluorescence was found to be caused by the presence of porphyrins in the harderian glands. Furthermore Figge et al (14) noted that when hematopo-

(11) Figge F. H. J. Relationship of pyrrole compounds to carcinogenesis. *Research Conf. Cancer* (1944), 117-128, 1945.

(12) Huepe W. C. and Figge F. H. J. Porphyrin excretion of harderian glands in relation to certain carcinogens in the hair of mice. *Cancer Research* 5: 328-330 June 1945.

(13) Bittner J. J. and Watson, C. J. Possible association between porphyrins and cancer in mice. *Cancer Research* 6: 337-343 July 1946.

(14) Figge F. H. J., Wand, G. S. and Manganiell, L. O. J. Cancer detection and therapy: Utility of neoplastic, embryonic and traumatized tissues for porphyrins and metalloporphyrins. *Proc. Soc. Exper. Biol. & Med.* 68: 640-641 July-Aug. 1948.

porphyrins were injected in mice with tumors and it was noted that the porphyrins concentrated in tumors, healing wounds and embryonic tissues. Apparently porphyrins have an affinity for growing tissue. On the basis of this data it may be assumed that some relationship exists between these two diseases although at present complete proof is lacking and the cause and effect relationship has not been determined.

## BOOK REVIEWS

*Fever Therapy* by H. Worley Kendall, M. D., F. A. C. P. Professor of Physical Medicine and Rehabilitation, University of Illinois, Research and Educational Hospital, Chicago, Ill. Publication Number 80, American Lecture Series. A Monograph in American Lectures in Physical Medicine, 161 pages, illustrated. Charles C Thomas, Publisher, Springfield, Ill. 1951. Price \$2.

This is an excellent compendium, written by an authority both in research and in the technique of the administration of fever therapy. This small booklet encompasses the subject including the selection of patients as well as the management of their treatment, bringing up to date the most valuable written material on fever therapy together with its indications. It contains an especially fine short summary as to the effectiveness as well as the limitations of fever therapy. This is an excellent manual and is indispensable for those who desire to use this therapy.—Col. E. M. Smith, MC, U. S. A.

*Treatment of the Nephrotic Syndrome* by Lee E. Farr, M. D., Chairman, Medical Department, Brookhaven National Laboratory, Physicist-in-Chief, Brookhaven National Laboratory Hospital, Upton, Long Island, N. Y. Publication Number 64, American Lecture Series. A monograph in American Lectures in Circulation, 61 pages. Charles C Thomas, Publisher, Springfield, Ill. 1951. Price \$1.75.

This easily readable monograph mentions a wide variety of modalities which have been used in the symptomatic treatment of the nephrotic syndrome. It is necessarily sketchy in the coverage of individual items but the author is definite in his recommendations and conclusions. In chapter 3 the discussion of the treatment of the renal lesion is divided into three aims: (1) to maintain maximal renal blood flow at 11 times; (2) to decrease the total work load of the kidney to a minimum; and (3) to correct biochemical deficiencies or to mollerate the effects of excessive retention of certain substances. In chapter 6, the use of cortisone, ACTH and nitrogen mustard not only to alleviate the edema but also in the hope of effecting a cure is mentioned. This book is recommended to anyone interested in bringing his working knowledge of the treatment of the nephrotic syndrome up to date.

—Commander J. F. Richardson, MC, U. S. A.

# Holding and Transport Medium for the Isolation of *Shigella*<sup>(1)</sup>

Arvey C. Sande 2, Lieutenant Colonel, MSC, U. S. A.

K. Okabe

R. P. Elrod (2)

Robert L. Hallinghorst, Lieutenant Colonel MC, U. S. A.

**A**LTHOUGH several enrichment and holding media which adequately serve in the isolation of *Salmonella* have been devised none have proved outstanding in the recovery of *Shigella*. In our experience no medium has been satisfactory even in the transport of fecal material to the laboratory much less to serve as a worthwhile holding or enrichment medium. Bangxang and Eliot (3) compared several of the older holding media with desoxycholate citrate combinations. They found that 1 percent citrate and 0.5 percent desoxycholate in a buffered saline solution was superior to a 30 percent glycerol-saline 3 percent normal sodium hydroxide 10 percent ox bile solution in preserving the viability of various species of *Shigella*. They were also able to locate healthy carriers who had not been detected when glycerin preservatives were used. It was suggested also that mandelic acid solutions might prove useful in this regard.

Brodie (4) has studied extensively a modified Leifson medium for the isolation and enrichment of dysentery bacilli. From a total of 93 positive specimens obtained by the combined efforts of direct plating on his rosolic acid citrate agar and by enrichment in a modified Leifson fluid medium citrate neutral red (CNR) broth, 68 (73.1 percent) were obtained by direct plating while only 47 (50.5 percent) were recovered by

(1) 406th Medical General Laboratory

(2) Deceased.

(3) Bangxang, E. N. and Eliot, C. P., Investigation of preserving solutions for recovery of dysentery bacilli from fecal specimens. *Am. J. Hyg. Sect. B* 31: 16-30, Jan. 1940.

(4) Brodie, J. Modified Leifson media for isolation of *B. dysenteriae* and pathogenic member of colon-typhoid group. *J. Path. & Bact.* 54: 499-509 Oct. 1942.

enrichment methods. Of the latter however 25 were obtainable only after enrichment, being undetected by direct plating. Substituting rosolic acid for neutral red in the enrichment fluid appeared to produce a more efficient medium. citrate rosolic acid (CRA) broth. In a series of 15 positive dysentery stools the CRA enrichment medium yielded 12 positive isolates. Only 9 were obtained by direct plating and only 7 were recovered from the CRR enrichment. The CRA broth recovered 4 not obtained by other methods whereas 3 were missed by this means. It has been recently reported by Brode (5) that his CRA broth was more effective when a shallow layer (2 mm) was used than when a deeper layer was used.

The medium used in most laboratories for transporting and holding fecal specimens is the buffered glycerol-saline medium (6). This method has been recommended by Galton et al. (7) and Ewing and Edwards (8). It has been our experience that this medium is only moderately satisfactory for the isolation of *Shigella* when heavily seeded with fecal material and is of little value in preserving rectal swab specimens unless followed by enrichment for the detection of *Salmonella*.

In view of the repeated observations that bacto SS agar is an excellent medium for the primary isolation of *Shigella* from fecal material, it seemed worthwhile to test this agar as a possible holding and transport medium. At the same time it was deemed advisable to test the efficacy of combined components of the SS formula and its comparison with buffered glycerol-saline broth. The CRR broth of Brodie with modification was used. Inasmuch as the main coliform inhibiting constituents of the Leifson formula are citrate and deoxycholate the various modifications of Bangs and Eliot were not used. It was also decided to use one of the standard *Salmonella* enrichment media in the test. Selective broth was the medium elected. The purpose of the experience was primarily to ascertain which medium was the most suitable for holding and transporting suspected fecal specimens to the laboratory for the isolation of *Shigella* organisms. Enrichment was not considered.

### MEDIA USED

Seven media were used in this comparative study

1. Bacto SS agar plates. These were made fresh daily.
2. Bacto SS agar slants. About 12 ml of freshly prepared SS agar was placed in sterilized 22 ml. screw-capped vials and slanted to produce the maximum surface.

(5) Brode, J. Shallow-layer fluid enrichment method for intestinal theptosis. *J. Path. & Bact.* 61: 120-121 Jan. 1949.

(6) Felsenfeld, C. Two surveys of methods used by public health laboratories for the examination of stool specimens for *Salmonellae*, *Shigella*, and *Proteus*. *Pub. Health R.* Wash. 65: 1075-1093, Aug. 1950.

(7) Galton, J. M., Hardy, A. V., and Mitchell, R. B. The public health laboratory diagnosis of enteric infections. *Am. J. Trop. Med.* 11: 50: 77-90 Jan. 1950.

(8) Ewing, W. H. and Edwards, P. R. Selection of *Salmonella* and *Shigella* cultures for serological identification. *CDC Bull.*, Atlanta 9: (5) 1-8, 1950.

3. CNR broth. This medium was the desoxycholate citrate medium of Leifson devoid of agar. It differed from Brodie's CNR broth in the substitution of pork infusion and difco proteose No. 3 for the serum peptic digest lemco broth and sodium desoxycholate for sodium taurocholate. Two milliliters were dispensed in 22 ml. screw-capped vials.

4. CRA broth. This was identical to the CNR broth substituting CRA for the neutral red, in amounts of 0.5 ml. of a 1 percent solution in absolute alcohol for each 100 ml. of broth. It likewise was dispensed in 22 ml. vials in quantities of 2 ml.

5. SS broth. The standard bacto SS agar formula minus the agar. This was dispensed in the same manner as the CNR broth.

6. Glycerol-saline broth. This buffered preservative was made up according to the formula given by Galton et al. (7) and dispensed in 12 ml. quantities in 22 ml. screw-capped vials.

7. Difco selenite broth enrichment medium as described by Leifson (9) dispensed in the same manner as the glycerol-saline broth.

Six of these omitting the CRA broth of Brodie were used for the first group of specimens. The omission of CRA broth was occasioned by the fact that we were unaware of the medium and the latest shallow layer technique until the project was underway. The CRA broth was then compared with the direct SS agar plate and the SS agar slant, the latter holding medium having shown the greatest promise during the culturing of the first 100 specimens.

#### SOURCE OF MATERIAL AND METHOD

One hundred and sixty-four fecal specimens were obtained from Japanese patients hospitalized in the Tokyo area. The clinical diagnosis in each case was dysentery. Each medium was inoculated with a cotton swab which was heavily impregnated with the specimen in question. The SS agar plate was streaked in such a manner as to insure isolated colonies. No attempt was made to achieve isolation on the SS slant but rather the material was smeared heavily on the surface. Each of the liquid media received a generous portion of the fecal material. All of the media were inoculated at the hospital and returned to this laboratory within a few hours. The SS agar plates were incubated immediately on return to the laboratory at 37° C. until the following morning. All other media were held overnight at room temperature and then incubated for from 16 to 24 hours at 37° C.

Transfer was made from test media to fresh MacConkey agar plates. In the case of the SS slant the total growth was mixed and then a part of the mixture streaked for isolation. After proper incubation the MacConkey plates were examined for nonlactose fermenting colonies. Four or five colonies from each SS and MacConkey agar plate were in-

(9) Leifson, E. New test enrichment media for isolation of typhoid and paratyphoid (*Salmonella*) bacilli. *Am. J. Hyg.* 24: 423-432 Sept. 1936.



oculated into a tryptose-phosphate booster broth containing 1 percent sucrose and lactose with brom cresol purple as an indicator. After 4 hours incubation those "booster" broths not showing definite acidity were inoculated into Kligler iron agar plus 1 percent sucrose, Simon's citrate agar and motility agar. Those cultures which are definitely acid were discarded. After inoculation, incubation was carried out at 37° C. for from 16 to 24 hours. The remaining alkaline "booster" broths were reincubated similarly. At the end of the period of incubation the booster broth was used to test for indol with Kovac's reagent. From these biochemical reactions suspected *Shigella* and *Salmonella* isolates were kept and the remainder discarded. No *Salmonella* were isolated from the first 100 specimens although the yield of *Paracolonobacter* ~~sterne~~ *sterne* was fairly high. The latter have not been tabulated in this article. Those which showed *Shigella* reactions were checked on polyvalent *Shigella* serum and if positive subsequently identified as to species and type.

### RESULTS

A total of 100 fecal specimens from 85 patients were cultured over a 3-week period, June and July 1950. Forty-six *Shigella* were recovered by all media, i. e., SS agar plate, SS slants, SS broth, CNR broth, glycerol-saline broth, and selenite broth. The direct plating on SS agar yielded 43 positives. This method failed to recover *Shigella* from 3 specimens found positive in 1 of the other media. The first of these was recovered from the SS slant, glycerol-saline broth and selenite broth, the second from CNR broth only and the third from CNR broth and the glycerol-saline broth. Thus 93.5 percent of recoveries were made by direct plating (table 1). Only the SS slant yielded more than 50 percent positive isolates. Definitive typing of the *Shigella* isolated showed 9 to be *S. flexneri* I, 27 *S. flexneri* II, 4 *S. flexneri* IV, 7 *S. flexneri* (X) and 5 *S. sonnei*.

TABLE 1. Recovery of *Shigella* from 100 fecal specimens by direct plating and 6 holding media

Medium	Number of Isolates	Percent of total positive isolates
All media	46	100.0
SS agar plates	43	93.5
SS agar slant	36	78.2
Glycerol-saline broth	23	50.0
SS broth	21	45.7
CNR broth	19	41.3
Selenite broth	11	23.9

The holding qualities of the SS slant were tested further by seeding fresh fecal specimens with *Shigella* streaking the slant and holding at room temperature for 1 week. Six slants were streaked with a specimen seeded with *S. flexneri* II and 6 with feces seeded with *S. sonnei* phase I. The slants were incubated at 37° C. and each day a portion of the growth was streaked on MacConkey's plates and suspected colonies treated as mentioned previously. It was found that the medium maintains *Shigella* under these conditions for 1 week at least. On the sixth day for example 11 of the 12 slants were positive although on the fifth day only 7 were positive. The latter figures also prevailed for the seventh day. The inconsistent results can be best explained by the fact that growth was not mixed before restreaking but rather a random loop of material was taken for the inoculum.

The effect of the age of the SS slant was also investigated. One set of bottled slants was kept at room temperature and another in the ice box at 4° C. At the end of 3 days 6 slants were inoculated with fecal material artificially seeded with *S. flexneri* II and 6 with material containing *S. sonnei*. After overnight incubation at 37° C. it was possible to reisolate the type II organisms from 5 of the 6 slants and *S. sonnei* from all 6.

A set of slants which had been held 7 days at room temperature and another set held in the ice box for the same time were tested in the same manner. *S. flexneri* II, was not recovered from any of the slants held at room temperature but *S. sonnei* was recovered from 3 of 6 slants. The set which had been held in the ice box before inoculation yielded type II organisms in all but one instance and *S. sonnei* from all 6 slants.

In further evaluation of Brodie's CRA broth, SS agar plates and bottled SS agar slants a total of 64 suspected stool specimens were tested. Of these 41 were positive for *Shigella* by direct plating while 29 were detected on replating to MacConkey's from the CRA broth and 30 were recovered from the SS slant. No positives were detected by CRA broth or the SS slant that were not accounted for by direct plating. Using CRA broth *Shigella* were recovered from 3 specimens which were negative using the SS slant, while 4 were positive using the latter which were negative using the former.

On definitive typing 31 were *S. flexneri* II (W) 5 *S. flexneri* I (V), 3 *S. flexneri* IV (Boyd 103), and 2 *S. sonnei*.

Salmonellas were recovered from 3 specimens. These consisted of 2 *S. paratyphi* A and 1 *S. typhosa* isolated by direct plating whereas 1 *S. paratyphi* A and the typhoid culture were recovered with the CRA broth. The SS slant yielded only 1 of the 2 *S. paratyphi* A isolates.

#### DISCUSSION

From the results compiled in this study there appears to be no substitute for direct plating for the isolation of *Shigella*. Nevertheless,

greater success has been attained by use of SS agar slants and CRA broth, than by the frequently used buffered glycerol-saline broth. The success of the SS agar slant in recovering 75 percent of the *Shigella* from proved positive specimens is apparently a reflection of the success of the medium when used in the plate. The old slant of the medium serves its would seem, one worthwhile purpose as the same formula minus only the agar (SS broth) was less successful. There was of course massive overgrowth by other fecal organisms in many instances. The percentage of recoveries was approached only by Brodie's CRA broth (table 2). As pointed out by Halbert (10) there are many coliform organisms which produce antibiotic substances which act against *Shigella*. The agar may prevent the ready diffusion of such substance—a condition not provided by a liquid medium. The use of SS agar in a sturdy screw-capped vial provides a means by which specimens may be transported easily to the laboratory.

TABLE 2. Comparison of SS agar slants, CRA broth, and SS agar plate recovering *Shigella*

Medium	Specimen	Number of <i>Shigella</i> isolates	Number of <i>Salmonella</i> isolates	Recovered (percent)
SS agar plates	64	41	3	100.0
SS agar slants	64	50	1	70.5
CRA broth	64	29	2	70.5

The chief difference between CNR broth and Brodie's CRA broth is that a special serum peptic digest and sodium taurocholate are used in the CRA formula and proteose No. 3 peptone and sodium desoxycholate are used in the CNR broth. Nevertheless the recovery rate is as determined by Brodie (50.5 percent) and that reported here (41.3 percent) for CNR broth are within limits not too widely divergent. The replating medium used in this study was MacConkey's agar. Brodie used CRA agar in his study.

The failure of selenite broth was not unexpected inasmuch as the medium was devised to aid in the recovery of *Salmonella* but the relatively poor result obtained with buffered glycerol-saline solution, was not foreseen. It has been recommended by others as the preserving medium of choice (6). Certainly the significant differences obtained between it and direct plating indicate that too much confidence has been placed in this procedure. Our attempts to plate *Shigella* from rectal swab culture which has been preserved in buffered glycerol-saline broth (7) have resulted in almost total failure. The plating of

(10) Halbert, S. P. Relation of antagonistic coliform organisms to *shigella* infections, survey observations. *J. Immunol.* 67: 25-36, Sept. 1948.

swabs so preserved yielded extremely poor results often showing no growth. We believe that this may be due to the transfer of enough of the glycerine solution to the plate effectively to inhibit growth. This is obviated for *Salmonella* at least by first transferring swabs to a satisfactory enrichment medium.

## BOOK REVIEW

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*Hypnoidal Psychotherapy* by Margaret St. ger Ph. D. Foreword by Frederick Bergstrom, M. D. 150 page Froben Press Inc. New York, N. Y. publisher 1951 Price \$3.50

This book presents a method of therapy using the period between normal sleep and wakefulness to exert constructive suggestive measures on patients with emotional illnesses. The therapeutic use of this state of semisomnolence preceding natural sleep is designated hypnoidal psychotherapy and differs from the hypnotic state in that it is a normal phase in contrast to hypnosis which is abnormal and may aggravate emotional conflicts. The oscillation between sleep and wakefulness is repeatedly emphasized as an ideal therapeutic medium for suggestive therapy and the author makes the statement that only material consciously understood and accepted by the patient can be used during the hypnoidal state. This immediately raises the question: What can be the advantage of the so-called hypnoidal state? To which the author replies that during the hypnoidal state suggestive influences and comments are more potent. The author places much emphasis on frustration as a source of mental conflict and proposes the theory that the initial frustration may have been the fear of suffocation during periods of oxygen lack by the newborn infant.

The comments on acquired and innate homosexuality are rather naive and the reports of successful treatment with hypnoidal psychotherapy of homosexuality and alcoholism are unconvincing. The book contains a brief but interesting discussion on ego-psychology, the origin of psychotherapy, and attempts to define the term psychotherapy. Throughout the book the case reports are few and those given are incomplete. The author's discussion of the rationale of psycho-gymnastics and the use of recorded hypnoidal interviews by the patient without direction or supervision of the therapist during the periods of relapse after completion of hypnoidal therapy is difficult to accept and is not in agreement with sound psychotherapeutic principles.

—Commander C. H. Bagenstoss MC USN

The apparatus herein described (fig. 1) consists of a flat piece of wood 12 inches long  $2\frac{1}{4}$  inches wide and  $\frac{5}{8}$  inch thick. At the distal end of this support is a rack 5 inches wide and 6 inches high which is arranged like a picture frame with the upper section of the frame removed so that a standard near-reading card can be inserted or removed with ease. Exactly 4 inches from the reading card is a screen 5 inches wide

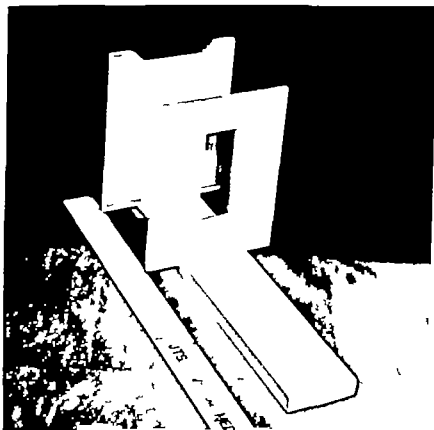
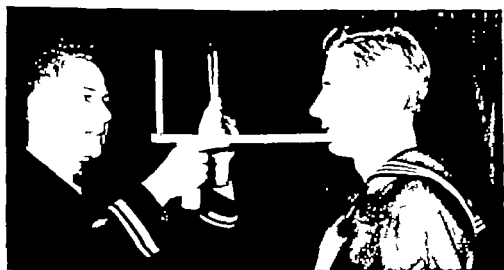


Figure 1. Testing device.

6 inches high, and about  $\frac{1}{4}$  inch thick, in the exact center of which is a vertical rectangular aperture measuring  $3\frac{1}{2}$  by  $1\frac{1}{4}$  inches. The entire apparatus is supported by an appropriate handle.

In using this instrument for testing purposes, the examiner should observe several precautions at all times. The patient being examined may be able to identify the eye with which he is seeing a specific area by noting the slight blur which occurs with refractive error in one eye. The refractive error as determined by retinoscopy should be corrected by lenses or trial frames worn by the patient during the test if the refractive error is large enough to affect near vision appreciably. If the



*Figure 2. Testing procedure.*

patient is presbyopic, the physician can usually make a reasonable estimate of the required addition for near vision on the basis of the age of the patient, and this addition should be included in the trial frame. The examiner stands before the patient places the proximal end of the apparatus on the chin of the patient, and then observes closely that the patient does not close either eye (fig. 2). If the examinee closes one eye after being instructed not to do so the examiner should cover the aperture quickly. The test is not entirely invalidated by the momentary closure of one eye because an understanding of the principle of the test does not tell the patient where he should start or stop reading each line. In this case an assistant can record the first or last word read in each line (depending on the eye which is supposedly deficient) and the result should plot a straight vertical line on the reading card if the patient is truthful. It is also possible (though difficult) for the person being examined to keep both eyes open and yet dissociate the eyes so that he may be able to concentrate on the field of vision of only one eye and read accordingly. This is more easily done with the dominant eye but in either case this offers no particular problem since a period of adjustment is required to accomplish this dissociation as well as a knowledge of what must be done to circumvent the purpose of the test. Lowering of the instrument temporarily will allow fusion to return and if the examinee is instructed to start reading immediately and moderately rapidly no unusual difficulty will be experienced.

The advantages of this instrument are that. (1) it is most useful in examining patients with questionable monocular amaurosis in which the unaffected eye has normal vision but it may often be used to advantage in examining patients with monocular amblyopia of moderate degree because a successful test will not only establish the fact that vision is present in both eyes but also give an estimate of the acuity (2) by the use of a rectangular rather than a square aperture it is possible to show

a full Snellen reading card and to use the varied-size print as the occasion demands (3) neither excessive accommodation nor convergence is required because the card is placed at a convenient reading distance and (4) the relatively large size of the aperture permits a large binocular field at the center of the card, avoids the confusing physiologic diplopia of the proximal screen when the distal rack is observed, and makes the shift from binocular to monocular perception effortless.

### SUMMARY

Measurements are given for a simple and easily constructed apparatus designed to establish the fact that vision exists in both eyes of a patient and to estimate the degree of visual acuity which is present. It is hoped that the instrument will be more widely used to detect malingerers who claim monocular disability although the examiner must constantly bear in mind the fact that the patient may have true hysteria.

### BOOK REVIEW

Lane Medical Lectures: Companionship of Water and Electrolyte in the Organization of Body Fluids by James L. Gambel, Emeritus Professor of Pediatrics, Harvard Medical School, Stanford University Publications, University series Medical Sciences, Volume V, Number 1, 90 pages, 42 illustrations, Stanford University Press, Stanford Calif., publisher, 1951. Price \$2.50.

The material in this booklet is derived mainly from a series of lectures given by the author over a period of years. In the preface the reader is asked not to regard these lectures as a review of existing knowledge in this wide field but as an attempt to portray a verbal of the larger features of the body fluids on the basis of current concepts. In successive steps he explains the chemical structure of the body fluids and the pathogenesis of acidosis and alkalosis, water and electrolytic balance, processes of dehydration and methods and rationale of parenteral therapy. The material is presented in clear, concise manner without the use of highly technical terminology and the booklet is generously illustrated by graphs and charts. Too often parenteral therapy is instituted by physicians who have little knowledge of the physiologic principles involved. A thorough study of this excellent booklet will eliminate many mistakes and serve to put this type of therapy on a more rational basis.—Col. C. A. Best, MC, U. S. A.

# The Reading Development Laboratory

John Hurley *Captain MSC U S A (1)*

**T**HIS school recognizes its responsibility for assisting students to develop abilities and acquire skills which they are required to possess for the performance of their professional duties. These requirements include the ability to read. One of the best ways of keeping abreast of developments in a profession is by reading. Yet it has been found that in common with most adults officers of the Medical Service generally have not developed their reading skills to a degree commensurate with the requirements of their positions. Because of lack of time every reader must restrict his reading to some extent. The poor reader however must often restrict his reading to the point where it will cause him to be critically lacking in the necessary information on which he must base decisions.

As an officer is promoted to higher command and staff duties his reading load of both technical and nontechnical material increases. Proportionately his reading ability must be increased. Accordingly in June 1949 this school opened its Reading Development Laboratory. The Reading Development Course at this school consists of 31 hours and is conducted over a 15-week period. The laboratory proper is composed of three stations.

Station A contains the tachistoscope bank. At present there are 20 tachistoscopes in the bank. The tachistoscope (fig. 1) is a high precision mechanism with 7 speeds from 1 full second to 0.01 second for flash exposure of colors, figures and other stimuli at a desired speed on a screen. This device gives excellent results in rapid recognition programs. The tachistoscope develops concentrated attention; improves visual memory and visual responses; reduces learning time and increases retention. In addition, it has clinical values for correcting certain visual deficiencies. Here each student is required to spend 15 minutes per class period working with 25 digit slides each 2 inches square. The student begins with the 5-digit series flashed at a speed

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(1) Reading Development Laboratory Medical Field Service School, Fort Sam Houston, Tex.



of 0.04 second and progressive speeds of 0.02 and 0.01 second successively when he has attained a score of 23 out of 25 slides at the indicated speed. He then proceeds to the 6-digit series and so on.

Station B contains the reading rate controller bank. At present there are 20 such controllers in the bank. Based on the pacing principle the controller (fig. 2) is a simple mechanical instrument designed to establish the maximum rate at which a person can read the material placed



*Figure 1 Tachistoscope or flashometer*

the instrument and then read other materials on his own at the same rate. It may be used as early as the beginning of the fourth grade of grammar school. Reading material is readily accessible inasmuch as most books, magazines and printed materials may be used. The occluding rate may be varied to meet individual differences in rate through range of from 50 to 2,200 words per minute (e.g. on a 15 cm. page the rate may be varied from 8 through 175 seconds or from about 50 to 2,200 words per minute in most books).

This instrument is valuable as a means of forcing the reader to cover the page at a constant rate so that he is stimulated to eliminate undesirable habits in reading. For example, some students are quite easily distracted while reading a book but when reading on the controller they are less likely to divert their attention. In other words, it acts as a motivating device to increase attention to reading. Further-

more the speed of the instrument may be increased gradually from day to day so that eventually the reader can achieve the rate he desires, or the rate the teacher plans for him. Some students who pronounce each word silently while reading can be induced to speed up their silent reading rates beyond their rates of articulation thereby establishing a superior habit of thinking meanings rather than saying words from which meaning is derived.

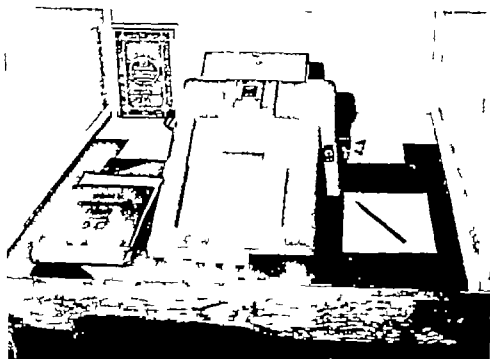


Figure 2. Reading rate controller

The value of the reading rate controller has been demonstrated at the University of Chicago Reading Clinics where students have increased their rates of reading from 30 to 250 percent without loss of comprehension. These results were obtained where students were carefully selected on the basis of a comprehensive diagnosis which showed their need for the type of instruction which may be provided through the use of this instrument. Here too, the student spends 15 minutes per class period. From his initial reading rate the student accelerates for the first 11 periods; then a reading comprehension test is given and depending on his score the student either continues to accelerate or he slows down until he has reached his saturation point. From the twelfth period through the twenty-eighth period he continues this jockeying until he feels that he has hit his stride. The twenty-ninth, thirtieth and thirty-first periods are concerned with final comprehension examinations.

Station C is the group study classroom. It is here that the student receives group tachistoscope work (digit series slides flashed at various speeds), series of 31 vocabulary checks (20 words per day), series of spot-check comprehension tests (short-reading selections with 10 questions each), series of verbalizing exercise where pairs of students work as proctor and student. Both read a lengthy selection. The student then repeats orally what he has just read. The proctor scores the student for comprehension. A series of Iowa State reading tests also given. Here also the students receive the 3 final timed comprehension examinations.

The objective of the reading laboratory is to improve the facility and speed of reading while maintaining high rate of comprehension. To this end the student is trained to read faster, to read for better comprehension, to suit his method to his purpose, and to remember what he reads.

Several tests of reading achievement are used in the laboratory. Improved eye-movement patterns are photographed. Pencil and paper tests of speed and comprehension are given to show the degree of change. Some show a gain in speed without loss of comprehension; some show gain in comprehension without loss of speed, and some show a gain in both speed and comprehension. Each of these gains is of the same kind—a gain in reading facility. A gain in comprehension indicates that the student has focused his attention on its objective spread while a gain in speed indicates that he has concentrated on "linear associative association." By either method his reading will be improved. Good readers have less inward vocalization, fewer regressive movements, a wider span of recognition, a quicker fixation time, and a better grasp of the thought patterns that are found in print. They have better general reading skills.

The reading development program at this school is part of an extensive movement. Since World War II interest in adult reading has increased phenomenally. This interest has by no means been confined to this school, or even to the Armed Services. The remarkable growth of college and business executive training programs in this field proves that this movement has been widespread and general. The results of courses conducted by our Reading Development Laboratory are shown in table 1.

Future plans for reading development courses at this school include the incorporation into group study periods of material in such subjects as leadership, military courtesy, preventive medicine administration, supply, etcetera. Thus, it is believed will be of material assistance to the student in his cadet work as well as in increasing his reading rate and comprehension.

A person cannot be successful in any field of reading unless he is able to interpret the printed matter quickly and easily. Serious readers

is often neglected by poor readers because their immature reading habits render such reading too difficult and time consuming. Consequently they have difficulty in obtaining sufficient information to provide them with a basis for judicious thinking. In many cases such readers understand thoroughly what they read and their critical reactions to the subject matter are of a high order but their cumbersome word-by-word reading method places a serious limitation on the choice and amount of their reading. The rapid reader is a phrase-by-phrase reader

TABLE 1. *Results of reading development courses in 11 classes*

Class	Before training		After training		Gain (percent)	
	Median reading rate (words per minute)	Median comprehension (percent)	Median reading rate (words per minute)	Median comprehension (percent)	Rate	Comprehension
1	273.7	80.48	571.5	82.1	109.0	1.62
2	266.0	71.1	524.0	93.5	96.9	24.4
3	223.8	66.5	515.2	70.9	128.1	4.4
4	234.0	62.14	500.0	72.29	113.7	10.15
5	206.0	51.0	448.0	93.0	117.4	42.0
6	257.0	52.1	524.0	93.9	104.0	41.8
7	250.0	62.0	532.0	94.0	113.0	32.0
8	267.0	76.0	569.0	95.3	113.1	19.3
9	288.0	50.0	609.0	93.0	111.0	43.0
10	340.0	65.2	672.0	91.1	98.0	25.9
11	301.0	83.8	765.0	88.3	154.0	4.5

He concentrates better. He gets a clearer concept of the writer's thought. If he wants details, he quickly sees how they fit into the whole picture. He brings to the printed page a fuller background of information. Because he can read more, the good reader is better informed. He possesses a greater store of material for sound analytic thinking. He develops good judgment, and over a period of time he achieves greater intellectual stature.

## BOOK REVIEW

*A Color Atlas of Morphological Hematology with Guide to Clinical Interpretation*, by *Guerris A. Deland, B. S.* Chief Laboratory Assistant in Hematology Thorndike Memorial Laboratory; Research Laboratory Technician, Boston City Hospital. Edited by *Thomas H. Le Ham, M. D.*, Assistant Professor of Medicine Harvard Medical School, Associate Director Thorndike Memorial Laboratory; Junior Visiting Physician, Boston City Hospital. 74 pages; illustrations by *Etta Pratt*. From the Second and Fourth (Harvard) Medical Service and the Thorndike Memorial Laboratory Boston City Hospital. Harvard University Press Cambridge Mass. publishers 1951 Price \$5

The author briefly discusses the preparation of blood films and discusses the diagnostic limitations of the blood film. Following this about one-third of the book is given over to the general characteristics of formed elements of blood as stained by Wright's stain and the maturation of the various series of formed elements. Criteria for recognition are given clearly concisely and are limited to those that can be applied to the Wright-stained film. Clear diagrammatic tables are used to illustrate maturation showing both marrow and peripheral blood elements as they are present normally and in disease. The author's purpose is not to discuss the various theories of maturation but rather to illustrate diagrammatically and by colored plates the criteria given in the text. This is ably accomplished since the color reproductions leave little to be desired.

The remainder of the book discusses the common anemia erythroblastosis fetalis the leukemias and infectious mononucleosis. The manner of presentation is unique in that actual cases are presented with color plates made as a composite from several blood films in proved case. Discussion of each condition is brief to the point include clinical discussion, history and follow-up and tabulation of the results of significant laboratory tests. The book is true it is well illustrated with adequate bibliography and a good index. It should prove to be of value to the laboratory technician and the hematologist as well as being of interest to the clinician.

—Col. C. J. Farnucci, MC U. S. A.

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# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
Agency Department of Defense*



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THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY  
THE DIRECTOR OF THE BUREAU OF THE BUDGET OCT 19 1949

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON 1951

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W. RANDOLPH LOVELLACE, II, M. D.

*Chairman, Armed Forces*

*Medical Policy Council*

*Department of Defense*

GEORGE E. ARMSTRONG

*Major General U. S. A.*

*Surgeon General U. S. Army*

LAMONT PUGH

*Rear Admiral M. C. U. S. N.*

*Surgeon General U. S. Navy*

HARRY G. ARMSTRONG,

*Major General U. S. A. F.*

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OFFICE OF THE SECRETARY OF DEFENSE  
ARMED FORCE MEDICAL POLICY COUNCIL  
WASHINGTON 25

**MEMO- Personnel of the Medical Services of the United States Armed Forces**

A program for expanding the hospital facilities of the Defense Establishment has been prepared by the Armed Forces Medical Policy Council after coordination with the three departments. Its purpose is to insure an adequate number of beds and efficient utilization of medical facilities with elimination of unnecessary duplication. The program for the current year was approved by the Secretary of Defense on 2 May 1951 and by the President on 11 May 1951. Programs for the future will be prepared annually and submitted for approval in similar manner.

Extensive studies are being carried out to develop more modern and efficient plans for hospital construction. New criteria based on missions to be accomplished are being established. Experience in dealing with military medical problems in peace and war, as well as opinions derived from civilian sources, present trends affecting hospital construction, are being carefully evaluated in the light of current and anticipated requirements. The desired goal is to determine the most efficient type of construction in terms of cost and services rendered and to adopt it for the Defense Establishment.

W. Randolph Lovelace, Jr.

W. Randolph Lovelace, Jr., M. D.  
Chairman

# Goiter Heart<sup>(1)</sup>

Samuel H. Rosen, M. D. (1)

THE ASSOCIATION of heart disease with disease of the thyroid has been known since the early descriptions of thyroid disease Parry (2) who in 1786 observed what he believed to be the first case on record of a malady later known as exophthalmic goiter placed the principal emphasis on this association and recorded 8 such cases. That was about 50 years before the disease was more completely re-described, by Graves in 1835 and more definitively by Basedow in 1840. The introduction of the term goiter heart has been attributed to Adelman (3). Although most of the early literature is in foreign journals much of the later work since the beginning of this century is reported in the American literature (4).

Goiter heart does not signify a single pathologic entity. In fact its connotation has been vague and the ideas as to its pathogenesis quite varied (5, 18). Reports using the term "goiter heart" refer to a number of pathologic states which have in common an enlargement but

(1) From the Laboratory Division, Montefiore Hospital, New York, N. Y.; presented at U. S. Naval Hospital, St. Albans, Long Island, N. Y.

(2) Parry, C. H. Collections from the published medical writings of the late Caleb Hillier Parry. Underwoods, London, 1825, vol. II, pp. 111-125.

(3) Ginsberg, A. M. Historical development of present conceptions of cardiac conditions in exophthalmic goiter. *Ann. Int. Med.* 5: 505-517, Oct. 1931.

(4) Symposium on the Thyroid Heart. *Am. Heart J.* 8: 1-154, Oct. 1932.

(5) Ros, E. Ueber den Kropfherz und die Radicalkur d. Kropfe. *Arch. f. klin. Chir.* 22: 1-71, 1878.

(6) Schranz, J. Beiträge zur Theorie des Kropfes. *Arch. f. klin. Chir.* 34: 92-159, 1887.

(7) Wölfler, A. Die chirurgisch Behandlung des Kropfes. August Hirschwald, Berlin, 1890, II, p. 82.

(8) Kras, F. Ueber das Kropfherz. *Wien klin. Wchsch.* 12: 416-421, Apr. 1899.

(9) Minale, W. Das Kropfherz, und die Beziehungen der Schilddrüsenerkrankungen zum Kreislaufapparat. *F. Deutsch. Leipzig und Wien*, 1904, IV, 1.

(10) Blauel, U. über das Verhalten des Herzens bei Struma. *Beitr. z. klin. Chir.* 62: 119-208, Mar. 1909.

(11) Scholz, W.: Ueber das Kropfherz. *Berl. klin. Wchsch.* 46: 381-385, Mar. 1909.

(12) Bucher, E. Weitere histologische Befunde bei durch Virus erzeugten Rattenstrumen und Kropfen. *Deutsche Ztschr. f. Chir.* 112: 368-424, Nov. 1911.

(13) Bauer, J. Die Herzstörungen bei endemischen Kropf. *Deutsch. med. Wchsch.* 38: 1966-1971, Oct. 1912.

(14) Crotti, A. The goiter heart. *Ohio State M. J.* 8: 61-66, Feb. 1912.

(15) Andrássy, Ueber Kropf und Kropfherz. *Beitr. z. klin. Chir.* 104: 35-45, 1917.

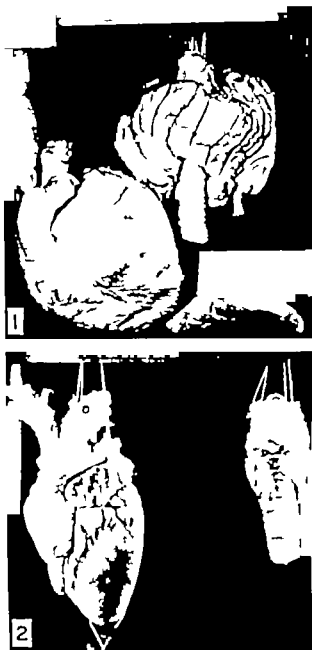


Figure 1. Mechanical gaster heart in newborn crella call. Left: Enlargement (mostly hypertrophy) of left and right side of heart and enlargement of artery and vein between heart and thyroid gland. Right: Large (upl) hyperplastic gaster showing slight lateral compression of trachea. Figure 2. Normal heart and thyroid gland of newborn.

not necessarily a palpable enlargement of the thyroid. These pathologic states may be classified as (17) (1) mechanical or true goiter heart, associated with simple hyperplastic (parenchymatous) goiter without hyperthyroidism (endemic or sporadic goiter); and (2) toxic goiter heart associated with an exophthalmic goiter. In earlier articles frequently clear distinction was made between the two types (11 13 14) because a confused state of knowledge of thyroid disease itself existed and because of failure to recognize coexistent independent heart disease. Goiter heart today generally refers to the latter type for which the terms *thyrocardiac disease* and more specifically *thyrotoxic heart disease* seem to be in vogue at present.

Neither type of goiter heart lends itself to demonstration with human material. The first type is now rare. Since the advent of iodine prophylaxis in the early part of the twentieth century large simple goiters with goiter hearts are rarely encountered even in such formerly endemic goiter regions as Switzerland, the Great Lakes and the Pacific Northwest regions. The heart in Graves disease usually shows little or no specific anatomic change either grossly or microscopically. As a clinical entity the toxic goiter heart appears to be diminishing (19). We have resorted therefore to animal material to illustrate this subject. The so-called myxedema heart is omitted from this discussion because although a form of thyroid heart disease it is not in the category of goiter heart.

### MECHANICAL OR TRUE GOITER HEART

Mechanical or true goiter heart has been seen in mammals, birds and fish, in association with simple hyperplastic goiter, spontaneous or experimental (17). It is seldom seen to day in man or spontaneously in animals because endemic goiter is no longer prevalent. Figures 1 and 2 show the contrast between a mechanical goiter heart in a newborn cretin calf (Cleveland 1912-D. Marine) and the heart and thyroid of a newborn normal calf. Microscopic examination of the goiter heart shown here revealed only hypertrophy of the myocardial fibers. Figure 3 shows the contrast between a mechanical goiter heart in an adult chicken (D. Marine) and the heart and thyroid of a normal adult chicken. The former shows enlargement (most hypertrophy) of the left and right sides of the heart; enlargement of the artery and vein between the heart and thyroid and one lobe of a large spontaneous simple goiter. Microscopic examination of the heart showed only hypertrophy of the myocardial fibers.

(16) W. Galin, C. In Henke, F., and Lubarsch, O. (editors): *Handbuch der speziellen pathologischen Anatomie und Histologie*. Achte Band—Drüsen mit inneren Sekretionen. Julius Springer, Berlin, 1926, pp. 424-427.

(17) Mori, D.: *Disease of the thyroid and parathyroid glands*. In T. C. F. (editor): *Practice of Medicine*. W. F. Prior Company, Inc., Hagerstown, Md., 1932, pp. 216-242, 259.

(18) Bishop, L. F., Jr.: Review of progress in study of goiter heart. T. Third Internat. Goiter Conf. & Am. A. Study Goiter, pp. 346-354, 1938.

(19) Kepler, E. J.: Heart in hyperthyroidism. T. Am. A. Study Goiter, pp. 106-112, 1940.

Table 1 (rabbits 4 and 5) illustrates the mechanical goiter heart in adult rabbits. The characteristic features of this form of goiter heart are enlargement of the heart, usually hypertrophy and dilatation of both sides and enlargement of the arteries and veins between the thyroid and the heart, the degree of enlargement varying, in part with the size and duration of the goiter (17). There are no typical microscopic changes in the heart other than the hypertrophy of muscle fibers. The degenerative and inflammatory change described by some in both human and animal hearts would appear to be attributable to intercurrent toxic, infectious and other processes (16, 20). The cardiac enlargement appears to be entirely a work hypertrophy which usually is associated with few or no symptoms (13) and may progress to congestive failure from overwork. The more severe manifestation as well as the greater incidence of the mechanical goiter heart and also of the toxic goiter heart occur in older people (10). The great increase in vascularity of the hyperplastic thyroid, as evidenced grossly by the marked hyperemia, pulsation of enlarged vessels, and hence enormously increased blood flow. In fact as much as half the output of the heart may be shunted through the gland (17). This results in increased venous return to the heart, which means that the heart must work harder in order to maintain an efficient systemic circulation. There is, in fact, a close analogy in many respects between the effects on the heart of a large hyperplastic thyroid and of an arteriovenous fistula. In both there is increased venous return with enlargement of the heart and of the proximal arteries and veins and, characteristically, no anatomic damage of the myocardium. In both there may be eventual heart failure. Surgical obliteration of the fistula, and iodine involution of the hyperplastic goiter (21), or surgical removal of the goiter (16) (table 1, rabbit 6), generally result in return of the heart and blood vessels toward normal size and relief of the heart failure. In the case of a goiter this occurs in spite of the fact that the colloid thyroid gland which results from iodine treatment of a hyperplastic gland may be as large as or even larger than the original goiter. It is no longer a gland of greatly increased vascularity. This fact supports the vascular shunt theory of the mechanism of cardiac enlargement in hyperplastic goiter.

In some instances, even colloid as well as a hyperplastic goiter sufficiently large and properly situated (for example a substernal or thoracic goiter) may compress large thoracic vessels and the trachea (stenosing goiter), and cause dyspnea, pulmonary emphysema, and bronchiectasis and give rise to an enlarged heart. The enlargement is attributed both to inspiratory dyspnea which produces increased sucking of venous blood into the thorax with overfilling of the right heart, and to expiratory dyspnea which causes pulmonary emphysema and bronchiectasis but the essentially a right-sided enlargement of the pulmonary

20. B. L. V. Van der R. C. Gortel, H. and E. J. C. Cardiac hypertrophy in thyroid disease preliminary report. *Am. Her.* 1: 8-15, Oct. 1932.  
 (21) Feer, E. Kropfen und Thyreotoxik der Neugeborenen und Stillgebende. *Monatsh.* 1: 14-25, Feb. 1923.

It was referred to as the *pneumonic* or *dyspneic* type of mechanical goiter heart and early received the principal emphasis (5 9). It did not respond to thyroidectomy as satisfactorily as the other type of mechanical goiter heart because of the concomitant pulmonary damage.

Other mechanical factors of a more theoretical nature were implicated in the cardiac enlargement due to goiter. One of these was the pressure of a large goiter particularly at the thoracic inlet on the vagal and sympathetic innervation of the heart which produced either a slowing of the heart with increased filling or an acceleration of the heart. This was referred to as the *neuropathic goiter heart* (7 15). Menne et al (22) produced pathologic changes in the rabbit's heart similar to those of experimental hyperthyroidism by surgically destroying the depressor nerve mechanism of the heart and thus greatly increasing the heart rate. Another mechanical factor believed to be responsible for the cardiac enlargement of goiter heart was a *vaso-paralytic* state attributed to the goiter which produced (1) hyperemia of the heart muscle with resultant excitation of the myocardial nerve ganglia (2) increased activity of the heart and (3) cardiac hypertrophy dilatation and degeneration (6 7).

**Summary** Of the various theories of the pathogenesis of mechanical goiter heart Marine's vascular shunt theory is well supported by facts, and would explain most instances of mechanical goiter heart including the large proportion of cases reported earlier which were not explained by the usual theories but were variously attributed to such things as (1) early or intermediate phases of Basedow's disease (7) (2) formes frustes of Basedow's disease (8), (3) Basedowified goiters, (4) thyroid poisoning which was a torpid form of goiter heart as distinguished from the overexcitable form of Basedow's disease (13), and (5) a general intoxication which was responsible for the changes in the heart as well as in the thyroid (11 12 14). The pneumonic or dyspneic type of mechanical goiter heart due to a stenosing goiter may account for a certain number of goiter hearts with right sided enlargement alone. The neuropathic theory and the theory of myocardial hyperemia are highly theoretical and not readily supported. Some early authorities maintained that a pure form of goiter heart did not exist (16). Although a pure mechanical goiter heart does exist particularly in animals as illustrated above and in newborn and infant children (16 21), it is entirely reasonable to acknowledge the occurrence of goiter heart due to a combination of the first two mechanical factors and that these particularly the first may also play a part in toxic goiter heart. Blauel (10) many years ago described, as one type of goiter heart a combination of the mechanical and the toxic goiter hearts.

(22) Menne F R, Jones O N and Jones N V: Change myocardium rabbits from goiter's heart rate mechanically and from induced hyperthyroidism Arch Path 17 333-355, Mar 1934

TABLE 1 *Mammals and toxic*

Rabbit no., sex, and breed	Simple goiter			Treatment	Result	Age at death (mos.)
	Size or weight (gram)	Duration (mos.)	How acquired			
1 F. B. ( ) (g)	6 <sup>+</sup> (b)	3	Spontaneous ( )	Removed right lobe (2.92 gm., marked hyperplasia) 20 day before death. KI 22 mg. in divided doses in 8 days, intraperitoneally beginning 14 day before death.	Severe hyperthyroidism Coagulative heart failure	6 <sup>+</sup>
2 (g)	6 <sub>-</sub> (b)	9 <sup>+</sup>	Cabbage diet (j)	KI 3 successive daily doses intraperitoneally beginning 26 day before death.	Severe hyperthyroidism	12
3 M. B. (a) (g)	7 <sub>-</sub> (b)	3 <sup>+</sup>	Spontaneous (a)	Removed left lobe (3.5 gm., marked hyperplasia) 14 days before death. KI 21 mg. in 11 doses, 12 days, intraperitoneally beginning 14 day before death.	Severe hyperthyroidism	6 <sup>+</sup>
4 M. B. ( ) (b) (l)	Moderate	11 <sub>-</sub>	Spontaneous (a)	None		14
5 M. D. (h)	Large	12 <sup>+</sup>	Methyl cyanide (d)	None		13
6 M. B. ( ) (b)	Large	12 <sup>+</sup>	Spontaneous ( )	Thyroidectomized at 15 mo.		29

This data as well as the specimens in figure 4 resulted from experiments on the pathogenesis of simple goiter and exophthalmos.

( ) Litter mates.

(b) Very peculiar on surgical inspection.

( ) Average weight of normal rabbit thyroid is 0.2 gm.

(d) Maria D. and Baumann E. J. Further studies on etiology of goiter.

Effect of cyanide on T. A. Am. Physician 47:261-267 1932.

( ) On diet of alfalfa hay and at low iodine content. (Maria D. P. thyroxine as a prevention of simple or adenoid goiter J.A.M.A. 104:2334-2341 Jan. 29 1935.)

*goiter hearts in rabbits*

Body weight at death (gms.)	Loss of body weight (gms.)	Thyroid			Heart	
		Weight (gms.) (c)	Histology	Weight (gms.) (f)	Gross	Histology
1 642	713	Left lobe 1 09	Colloid involuted	9 1	Hypertrophy and dilatation of right and left sides	Hypertrophy of myocardial fibers focal fatty degeneration and necrosis focal replacement fibrosis
1 505	1 130	Decrease in size	Colloid, involuted	8.4	Hypertrophy and dilatation of right and especially left sides	Hypertrophy of myocardial fibers focal fatty and hyaline degeneration, patchy myocardial fibrosis
1 755	750	Right lobe 2.3	Colloid, involuted	7 4	Mainly hypertrophy of right and left sides	Hypertrophy of myocardial fibers focal fatty degeneration and focal necrosis fibrosis
2 720		1 09	Moderate hyperplasia involuting	7 1	Hypertrophy and dilatation of right and left sides	Hypertrophy of myocardial fibers and significant lymphocytic infiltration.
2 311		6 2	Moderate hyperplasia involuting	6.3	Hypertrophy and dilatation of right and left sides	
3 018		Absent (surgically)		5 9	Pale and flabby	

(f) Average weight of normal rabbit heart (B & D breeds) of 1 500 to 2 000 gm. 4 to 5 gm. of 2 000 to 2,500 gm is 4.5 to 5.5 gm. of 2 500 to 3 000 gm is 5 to 6 gm.

(g) Rabbits 1, 2, and 3 died of fulminating hyperthyroidism.

(h) Rabbits 4, 5 and 6 were sacrificed.

(i) Rabbit 4 had a chronic infection of the jaw all the others were free of infections

(j) Marine D., Baumann, E. J. and Cipra, A.: Studies on simple goiter produced by cabbage and other vegetables. Proc. Soc. Exper. Biol. & Med. 26: 822-824 Jun 1929

B Belgian, D Dutch F female M male



## TOXIC GOITER HEART

The most important type of goiter heart is the toxic or thyrotoxic type. It is associated with Graves disease but it is not a well-defined entity. Kraus (8) first differentiated the two types of goiter heart. The part that hyperthyroidism plays is uncertain (4). The problem is whether hyperthyroidism produces a distinct form of heart disease or whether it is merely a contributory factor in the presence of established heart disease. Clinically the term toxic goiter heart or "thyrotoxic heart disease" is applied to patients with hyperthyroidism associated with auricular fibrillation, congestive heart failure or angina. These cardiac findings may completely obscure the underlying Graves disease and simulate primary heart diseases (so-called masked hyperthyroidism). In human hearts hyperthyroidism per se produces few or no demonstrable organic changes. Evidence has been presented that the thyroid hormone acts either directly on the heart muscle or on the terminal nerve endings (23), and has a "heart accelerator" factor in addition to the factor which increases metabolism (24). The heart may be moderately hypertrophied or dilated or both. There may be generalized or limited to the left id and may include the great vessels between the thyroid and heart. There is some difference of opinion as to the incidence of these abnormalities. The greater enlargement of the heart occurs in about 50 percent of patients with Graves disease complicated by hypertension or coronary artery disease or the mitral heart disease. The occurrence of this enlargement is more frequent in the presence of congestive failure (25). The myocardium in Graves disease on microscopic study shows (1) hypertrophy of fibers (2) fatty and hyaline degeneration of the fiber (3) infiltration with cells and (4) occasionally necrosis and fibrosis (26, 30). With few exceptions all the pathologic changes are associated with a coexistent heart disease or probably even frequently a heart presumed to be normal (20, 25, 31).

(23) Maikowicz, C. and Yser, Y. M. Response of experimental animals to thyroxine. *Am. J. Physiol.* 100: 162-166, May 1932.

(24) Meyer, A. E. and Marine, D. Action of pathological thyroids from rabbit and sheep on metabolism and heart rate in thyroidectomized rats. *Endocrinology* 50: 558-563, Apr. 1942.

(25) Friedberg, C. K. and Sokol, A. R. Occurrence and pathogenesis of cardiac hypertrophy in Graves disease. *Am. Heart J.* 13: 599-618, May 1937.

(26) Askanazy, M. Pathologisch-anatomische Beiträge zur Kenntnis des Morbus Basedowi insbesondere über die dabei auftretende Muskelerkrankung. *Deutsches Arch. f. klin. Med.* 63: 118-186, Sept. 1898.

(27) Fakis, T. Histologische Begleitung am Kropferherzen. *Zentralbl. f. allg. Path. u. Anat.* 27: 1-5, Jan. 1916.

(28) Goodpaster, F. W. Myocardial necrosis in hyperthyroidism. *J. A. M. A.* 76: 1545-1551, Jan. 4, 1921.

(29) Hersh, M. H. Heart in experimental hyperthyroidism with special reference to its large endocrinology. 5: 579-606, Sept. 1921.

(30) Lewis, J. W. On the peculiar myocardial lesion in hyperthyroidism (The reeler disease). *Am. J. Path.* 8: 255-262, Mar. 1932.

(31) Rak, G. and McEachern, D. Study of heart in hyperthyroidism. *Am. Heart J.* 16: 73, Oct. 1912.

The repeated clinical observation that in young patients with otherwise normal hearts Graves disease may exist for several years without any evidence of cardiac insufficiency supports the belief that uncomplicated hyperthyroidism produces no specific organic lesions of the heart. Means (32) cites a case of 17 years duration Thyrotoxic heart disease with its accompanying auricular fibrillation enlargement and congestive heart failure is usually encountered in patients over 40 years of age. It is then present because of some other disease such as hypertension arteriosclerosis syphilis or senescence (33). Of 108 patients with thyrotoxic heart disease studied by Barker et al (34) the average age was 51.5 years. When cardiac manifestations occur in younger patients it is usually on the basis of rheumatic heart disease. Hyperthyroidism aggravates the organic lesions of these diseases and they become clinically manifest. It is a contributory or precipitating factor in causing the decompensation of compensated organic heart disease (35). The hyperthyroidism not only increases the demand on the heart for work but also decreases the ability of the heart to perform increased work. An increase in the heart rate caused by the direct action of the thyroid hormone on the myocardium (23, 24, 36), and by the elevation of the general body metabolism both cause an increase in cardiac output. This is evidenced clinically by an increased pulse rate a widened pulse pressure an increased minute volume an increased blood volume a rapid peripheral blood flow an increased venous return and an abnormal response to exercise or other stress (19, 37). The decreased cardiac reserve is caused by impaired nutrition of the myocardium which results from a decreased reserve supply of (1) glycogen (35, 37) (2) creatine (38) (3) phosphates (39) and (4) adenylyl-pyrophosphoric acid (40) and an increase of the concentration of lactic acid (35) and nonprotein nitrogen (41). A decrease in the body stores and intake of

(32) Means J. H. The Thyroid and Its Diseases. J. B. Lippincott Co. Philadelphia. 1937 p. 429.

(33) Maber C. C. and Stiller W. W.: The cardiovascular state in thyrotoxicosis. J. A. M. A. 106: 1546-1557 May 1936.

(34) Barker P. S., Bohning, A. L., and Wilson F. N. Auricular fibrillation in Grave's disease. Am. Heart J. 5: 121-127 Oct. 1932.

(35) Andrus E. C.: Heart in hyperthyroidism. Clinical and experimental study. Am. Heart J. 5: 66-74 Oct. 1932.

(36) de Wasselow O. L. V. S. and Griffiths W. J.: Role of adrenal gland and of raised metabolism in production of organic hypertrophy in thyroid-fed rats. Brit. J. Exper. Med. 19: 347-353 Oct. 1938.

(37) Defaux J.: Sur les variations du glycogène cardiaque chez l'animal en hyperthyroïdie expérimentale. Compt. rend. Soc. d. Biol. 105: 228-230 Oct. 1930.

(38) Bodanly M. and Pilcher J. F.: Creatine content of heart in experimental cardiac hypertrophy due to hyperthyroidism. Proc. Soc. Exper. Biol. & Med. 32: 597-598, Jan. 1935.

(39) Mastromet C.: Chemische Beiträge zur Frage der Herzmuskelschädigung durch Thyroxin. Ztschr. f. d. ges. exper. Med. 90: 237-244 1933.

(40) Berg, H.: Ueber den Herzmuskulstoffwechsel bei Hyperthyreose und eine Beeinflussung durch Vitamin C. Arch. f. exper. Path. u. Pharmacol. 185: 359-367 1937.

(41) Sjögren, O. A., Nannova N. and Ungerova N.: Chemical and pharmacodynamic characteristics of heart in hyperthyroidism. Klu. Med. 13: 1285-1291, Sept. 1933.

vitamins especially B<sub>1</sub> and C (32, 42, 43) and a decrease in coronary blood flow due to relatively low diastolic pressure disturb the metabolism of the cardiac muscle further.

The heart muscle like the skeletal muscles may be actually weakened in Graves's disease (19). The degree of this myocardial weakness may be variable. It is not surprising that cardiac failure is reported in some cases of Graves's disease without evidence of organic heart disease because of the impaired functional capacity and the increased work of the heart (19, 44). The occasional finding of significant myocardial lesions in Graves's disease uncomplicated by other heart disease may also be explained on the same basis (22). The situation is in a limited sense analogous to that in hypertensive heart disease in which focal myocardial degeneration, necrosis, and fibrosis result when the coronary blood supply of the myocardium does not keep pace with the increased need of the hypertrophied cardiac musculature occasioned by the increased work of the heart. It is also possible as suggested on both clinical and experimental grounds (22, 31, 43, 45) that the heart in hyperthyroidism is more susceptible to injury by even mild intoxication and infection. All these factors may produce structural changes in the heart by augmenting the effect of concomitant cardiovascular disease. If the hyperthyroidism is cured the cardiac disturbances even though they may be due to independent organic damage are usually improved (19). This points to the greater role which functional factors play in the causation of thyrotoxic heart disease (31, 46) and also emphasizes the importance of correct diagnosis and treatment for this condition.

Figure 4 contrasts combined toxic and mechanical goiter heart in a young rabbit with the heart and thyroid of a normal rabbit. The diseased rabbit (no. 1 in table 1), a Belgian female aged 6½ months, spontaneously developed palpable simple goiter at least 3 months before death, on a stock goitrogenic diet of alfalfa hay and oats of low iodine content. Twenty days before death the thyroid was examined under ether anesthesia and the right lobe was removed. The blood vessels to the thyroid were found to be greatly dilated and the superior thyroid arteries were pulsating. The gland itself was greatly enlarged and markedly hyperemic. The resected right lobe weighed 2.92 grams and the whole gland was estimated to weigh about 6 grams (The average weight of the normal thyroid in a rabbit is 0.2 gram.) The enlarged

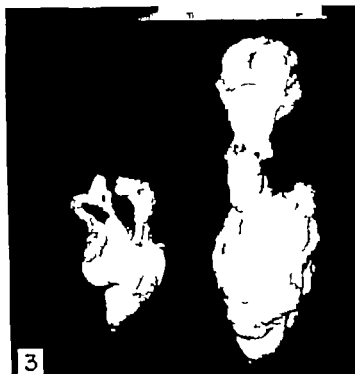
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*Figur 3* Right: Mechanical goiter heart in adult chicken. Left: Normal heart and thyroid gland (2 lobes) of adult chicken. *Figure 4* Right: Goit heart (toxic and mechanical) in young rabbit. Left: Normal heart and thyroid of rabbit of about the same age and body weight as the goitrous rabbit before iodine treatment.

thyroid shown in figure 4 is from another rabbit with the same simple hyperplastic type of goiter and weighed 6.2 grams. Microscopically the resected lobe showed marked hyperplasia of the follicles and marked dilatation of the blood vessels. Beginning 14 days before death the rabbit received 22 mg. of potassium iodide by intraperitoneal injection in divided doses over a period of 8 days. It promptly developed severe hyperthyroidism as manifested by restlessness, diarrhea, tachypnea, forceful heart action, and later loss of appetite, marked weakness, and emaciation. Rectal temperature on one occasion was  $104.6^{\circ}\text{F}$  (normal is about  $102^{\circ}\text{F}$ ). The course was rapidly downhill to death only 14 days after the first injection of KI. The rabbit had lost 713 grams or a little less than one-third of its body weight in this time. The response of the rabbit with a simple hyperplastic goiter to the administration of iodine is to produce an excess of thyroid hormone with resultant hyperthyroidism. This is analogous to the condition termed Iodine Based diseases in human beings in whom it is a rare occurrence.

At autopsy the remaining left lobe of the thyroid seemed somewhat reduced in size from its state at the time of surgical inspection before iodine medication. It weighed 1.09 grams (the hyperplastic right lobe had weighed 2.92 grams), and showed the typical translucent pale-amber gross appearance and the colloid microscopic appearance of iodine involution. The heart was rather markedly enlarged weighing 9.1 grams (average weight of heart for a rabbit of this size is from 4 to 5 grams). There was hypertrophy and dilatation of both left and right sides. Microscopically (1) hypertrophy of the muscle fibers of the ventricles, (2) focal fatty degeneration and necrosis of muscle fibers and (3) many areas of replacement fibrosis—some early with loose fibrillar connective tissue containing few small round cells, occasional eosinophil and neutrophils and few well generated or crotic muscle fibers and some older with denser connective tissue were seen (figs. 5, 6, and 7). The myocardial lesions appeared to be recent and were considered due to the advanced severe hyperthyroidism. The enlargement of the heart, was in part caused by the hyperplastic goiter and to a certain degree antedated the hyperthyroidism. There was definite evidence of congestive heart failure which appeared to be the major cause of death. Fibrinous fluid was present in the pleural, pericardial and peritoneal cavities. The lungs

Figure 6. Section of left ventricle of goiter heart shown in figure 4 (right). Note hypertrophy and focal necrosis (fatty) degeneration of muscle fibers (Hematoxylin-e in stain X 220.) Figure 7. Section of left ventricle of goiter heart shown in figure 4 (right). Note large area of older myocardial replacement fibrosis with denser more cellular but still quite cellular connective tissue containing many enlarged capillaries and few small round cells (Hematoxylin-e in stain X 100.)



were congested and edematous. The liver grossly was nutmeg in appearance and on microscopic examination showed congestion and pressure necrosis of the centers of the lobules.

In animals as illustrated in rabbits 1, 2, and 3 (table 1), the experimental production of hyperthyroidism causes more definite organic heart changes than in human being but here also there is a singular lack of uniformity in reporting results (43-47). The changes noted are (1) hypertrophy and dilatation of the heart, (2) foci of degeneration and necrosis of muscle fibers, (3) replacement fibrosis, and (4) an infiltration of small round cells with occasional polymorphonuclear leukocytes and eosinophils. Congestive heart failure which is attributable to the hyperthyroidism, may result (rabbit 1, figure 4). For this to occur severe hyperthyroidism must be produced. It is not sufficient merely to elevate the B.M.R. (48). It is possibly this difference in the degree of hyperthyroidism which partly accounts for the difference in the effect on the heart of man with Graves' disease and an animal with experimental hyperthyroidism. The increase in weight of the heart of the goitrous rabbits made hyperthyroid with iodine (table 1, rabbits 1, 2, and 3) was greater than that produced in our laboratory in thyroidectomized rabbit made hyperthyroid with desiccated thyroid (48). This suggests that even in hyperthyroidism associated with a hyperplastic goiter the mechanical factor of vascular shunt through the thyroid gland plays a part in the hypertrophy of the heart. In Graves' disease also the two factors—mechanical and "toxic" probably operate (17). Both factors produce an increased venous return the first through a vascular thyroid shunt as described above and the second through dilatation of small vessels with establishment of peripheral arteriovenous shunts (37). As indicated above hyperthyroidism acts in other ways also.

Even in patients with long-standing uncomplicated Graves' disease little or no demonstrable change occurs in the heart, yet in most cases of Graves' disease with enlarged thyroid some enlargement of the heart is probably present even though it may not be demonstrable by the usual means and may be of no clinical significance. That this hypertrophy is relatively slight although the work load of the heart is greatly increased is to be partly attributed to the serious interference with the nutrition of the heart muscle. The nutrition of the myocardium is a limiting factor in cardiac hypertrophy. It has been suggested also that the relatively insignificant hypertrophy of the heart in Graves' disease may be attributable to a normal stroke output although the minute output is increased (37). The muscle fibers are of normal diastolic length and the fundamental stimulus to hypertrophy is absent.

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## CONCLUSIONS

Thyrotoxic heart disease is not a distinctive type of heart disease. The toxic goiter heart is a heart which generally shows little or no structural alteration beyond slight enlargement, but which nevertheless has serious impairment of its functional capacity. Hyperthyroidism increases the work of the heart while it impairs the nutrition. The heart can withstand this unfavorable situation for a surprisingly long time but if compensated cardiac damage due to hypertension, arteriosclerosis, syphilis, rheumatic fever or senescence is present, the impaired functional capacity may contribute or precipitate clinical thyrotoxic heart disease. The occasional occurrence in Graves' disease of cardiac insufficiency without organic heart disease is explained by (1) deficient nutrition of the myocardium, (2) increased work of the heart and (3) increased vulnerability of the heart to even mild intoxications and infections. The occasional occurrence of myocardial lesions presumed to be due to hyperthyroidism in the absence of other heart disease can be explained in the same manner. There is no evidence for a cardiotoxic principle to explain the cardiac disturbances in Graves' disease.

## BOOK REVIEW

*Frontal Lobotomy and Affective Behavior: A Neurophysiological Analysis* by John F. Fulton, M. D. Sterling Professor of Physiology, Yale University. 159 pages. Illustrated. W. W. Norton & Co., Inc., New York, N. Y. Publisher 1951. Price \$3.

For the Salmon Memorial Lectures herein published, Dr. Fulton selected the general theme of human and primate behavior as affected by specific lesions of the forebrain, particularly the frontotemporal complex. Previously the same author had summarized earlier work in this field up to 1948 and in this publication endeavors to review work carried out since that time. There is a section on historical background, then a discussion of recent material on the functional anatomy of the fronto-cingulo-temporal cortex. The third of this book's four chapters deals with behavioral studies in monkeys, baboons, and chimpanzees. The concluding chapter deals with frontal lobotomy in relation to human behavior. The author notes two developments within the past 3 years: (1) The use of a more restricted operation and (2) adaptation of the operation to the nature of the mental illness.

—Col. J. W. Kemble, MC, U. S. A.



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# Treatment of Nerve-Gas Casualties<sup>(1)</sup>

John R. Wood, *Colonel, MC, U. S. A.*

Paul F. Dickens, Jr., *Commander, MC, U. S. N.*

John Rizzolo, *Major, U. S. A. F. (MC)*

Milward W. Bayliss, *Colonel, MC, U. S. A.*

**T**HE nerve gases are a group of highly toxic chemical agents having a physiologic action like but much more prolonged than, physostigmine. They are readily absorbed through the respiratory tract, the skin, the eyes, and the gastrointestinal tract. Symptoms induced by incapacitating or lethal doses begin immediately and progress at a rapid rate.

Casualties contaminated with liquid nerve gases endanger unprotected personnel. Handlers of such patients should wear protective rubber aprons and gloves so long as there is any chance of skin or clothing contact with the liquid agent. Liquid nerve gases slowly penetrate even heavy rubber aprons and gloves; hence any liquid agent observed on the aprons or gloves should be washed off as soon as practicable and they should be changed for uncontaminated aprons and gloves after several hours of continuous use. A gas mask is essential as nerve-gas vapors from such casualties will quickly incapacitate attendants.

Neither personnel nor equipment contaminated with liquid nerve gas should be brought into a hospital or an enclosed space until the liquid nerve gas has been completely eliminated. The nerve gases are soluble in water and may be removed by flooding with water in a shower. The clothing from such a casualty should be removed promptly and left outdoors along with such contaminated items as blankets, litter, and equipment. Ambulances and other equipment used for transporting casualties contaminated with persistent liquid nerve gas must be decontaminated.

The gas mask protects the eyes, respiratory tract, and mouth from nerve gases in either vapor or spray form. Ordinary clothing or impregnated permeable protective clothing afford little protection to the

(1) Chemical Corps Medical Laboratory, Army Chemical Center, Md.

1 to several days. The sense of tightness in the chest and difficulty in breathing are harassing but do not cause hypoxemia. With this degree of exposure all subjects will exhibit extreme miosis lasting several days and will have ciliary spasm with attendant pain in the eyes radiating as headache either frontally or to the occiput and some difficulty of accommodation. Moderate photophobia is usually present, and focusing the eyes on near objects is a painful experience. Rhinorrhea lasting several days is a minor complaint. The patients suffer loss of efficiency but are not incapacitated.

A further increase produces such aggravation of the above symptoms that extreme harassment or borderline incapacity result. Under great military necessity most of these subjects could continue combat duties at reduced efficiency but many would probably be treated as mild casualties under less pressing circumstances.

At larger dose the zone of true casualty production is reached. Bronchoconstriction though intermittent and not complete is so continuous and breathing is difficult that the victim is unable to carry on his duties. Mild hypoxemia may be present during bronchospasm and the subject may be confused, panicky and fearful of suffocation. Rhinorrhea, beginning bronchorrhea and slight cough, extreme miosis, ciliary spasm, pain of accommodation, headache and photophobia add to his misery.

With large doses all unprotected men will be casualties, many with alarming symptoms. This is still small exposure by comparison with casualty-producing doses of other standard chemical agents and doses of the agent exceeding this will almost certainly be met in any modern chemical attack. At this dosage the airway may be almost completely closed by bronchoconstriction and laryngeal spasm, complicated by bronchorrhea. Up to this point the subject's muscular effort at respiration is powerful but very little ventilation of the lung is accomplished. As his anoxia increases he becomes more confused and may fall exhausted and unconscious. His muscles of respiration now fatigued and weakened gradually lessen their efforts. The heart rate accelerated at first now weakens and slows and the blood pressure falls. The airway tightly constricted until now relaxes slightly. Muscular tremors develop followed by fibrillary twitching and often by occasional clonic convulsions caused by the combined effects of anoxia and the direct action of the nerve gas on the central nervous system. Paralysis of respiration is usually not complete at this dosage and the subject retains enough muscular function to ventilate his lung through his gradually relaxing airway and thus survives the anoxia.

Meanwhile he suffers many of the classical symptoms of muscarinic poisoning: salivation, rhinorrhea, exophthalmos, glandular secretion into the intestine with hypermotility, nausea, vomiting, abdominal

cramps watery diarrhea and possibly incontinence of urine and feces. Miosis ciliary spasm photophobia and headache are severe. At several times the severe casualty dose the lethal range is reached. The clinical findings in the fatal case are similar to those in the severe casualty but increased in tempo and severity. The initial blocking of the airway is virtually complete and extreme anoxia, collapse and unconsciousness come on more quickly. On collapse the paralysis of respiration is complete and despite relaxation of the airway spontaneous respiration is impossible. Clonicotonic convulsions are a prominent terminal feature and is followed by generalized flaccid paralysis. The bradycardia is extreme often resulting in a sudden and complete arrest of heart action which may be either a temporary or a terminal event. Massive salivation and incontinence of urine and feces are the rule.

*Effects of liquid.* Liquid anticholinesterase agents are absorbed rapidly from the eye and mucosa of the nose or mouth by which routes they are extremely toxic. The time element from contamination of these areas to the initial development of systemic symptoms is 1 or 2 minutes and death follows rapidly in fatal cases. Absorption through the skin from direct skin contamination or from liquid contamination of the clothing is a somewhat slower process and larger doses are required to produce the same degree of poisoning. The time from contamination to initial systemic symptoms is however still relatively short—from 5 to 20 minutes depending on the type of agent the magnitude and anatomic location of the contamination and the physical condition of the skin. Usually the first sign to appear following skin contamination is localized muscular twitching at the site of contamination. This is soon followed by bronchoconstriction and salivation then mental confusion and excitement then generalized clonicotonic convulsions. If the eyes have been protected from direct access of the liquid agent and its vapor miosis does not appear until the poisoning is well advanced. The clinical course of the poisoning is otherwise much the same as that caused by the inhalation of nerve-gas vapor.

*Psychophysiological effects.* The survivors of anticholinesterase poisoning may exhibit mental effects for several days following exposure. In patients with mild exposure there may be giddiness tension anxiety jitteriness insomnia and excessive dreaming. With more severe exposure there may be withdrawal depression restlessness tremor emotional lability and irrational behavior. The EEG may show intermittent burst of slow waves (from 4 to 6 per second) of normal to elevated voltage especially following hyperventilation. Military commanders and medical officers must give serious consideration to the possibility of panic among combat personnel in nerve-gas attacks and take all possible steps to prevent or control it.

## DIAGNOSIS

The diagnosis is made from the symptoms. Unprotected personnel exposed to vapor or aerosol first experience a running nose, a sense of tightness in the chest, and exhibit miosis. Masked men poisoned by the absorption of an anticholinergic terase agent from liquid contaminations of the skin or clothing first experience local muscular fasciculations followed by bronchoconstriction. Ingestion of contaminated food or water first induce salivation, nausea, and abdominal cramps which may be followed by vomiting and diarrhea. Marked salivation, bradycardia, hypotension, bronchoconstriction with cyanosis, muscular twitching, and convulsions are diagnostic signs of importance in the more severe cases.

## FIRST AID AND EMERGENCY TREATMENT

Severely wounded men or persons severely poisoned with an anticholinesterase agent may be incapacitated and incapable of administering self-aid. Such patients must have help from aid men, or other available personnel adjusting gas masks, decontamination, and in the administration of tropine. Liquid contaminations on the skin must be removed immediately by flooding with water or by swabbing the contaminated skin with cotton or cloth pledgets which are well wetted with a suitable fluid. Alkaline fluids are much more effective than plain water. Any of the following fluids is satisfactory: (1) a slurry of 1 part of bleach in 3 parts of water by volume; (2) 5 to 10 percent solution of sodium carbonate; (3) a 5 to 10 percent solution of ammonium hydroxide; or (4) 2 percent solution of sodium hydroxide. If none of these is available wash the contaminated skin with soap and water after flushing with water. Clothing and equipment contaminated with liquid nerve gas must be removed from casualties as quickly as possible and the casualty moved out of the contaminated area.

Injections of 2 mg. of tropine sulfate by nonprofessional personnel may be given at 3-minute intervals if necessary up to a total of 6 mg. If the patient has convulsions but is not cyanotic when found the 6 mg. of tropine must be given promptly in one injection.

If respiration has ceased there is no hope of survival unless an effective method of resuscitation can be instituted immediately. Because the nerve gas produces a peripheral flaccid paralysis of the muscles of respiration the chest is collapsed and there is little expiratory reserve. Because of this paralysis there is no elastic recoil when the chest is compressed and released. Effective methods of artificial respiration such as the Holger-Nielsen method or the hip-lift prone-pup are recommended as described by Emerson, Ivy, and others as both inspiration and expiration.

If in a contaminated area the victim's mask should be kept on and properly adjusted before artificial respiration is started. In the Holger-Nielsen method the patient is placed in a prone position, face to one

side neck hyperextended with the hands under the head. The operator kneels at the patient's head, grasps the arms near the elbows and pulls the elbows upward and forward toward the head, expanding the chest and causing active inspiration. He then releases the patient's arms, causing passive expiration. He then places his hands on the patient's back near the lower borders of the scapulas and exerts pressure on the chest, resulting in active expiration. The pressure is then released, causing active inspiration. This cycle should be repeated from 10 to 12 times a minute.

In the Schafer-Emerson-Ivy (hip-lift prone-pressure) method the mask is adjusted as before if in a contaminated area and the victim is placed in a prone position with his hands under his head and the neck hyperextended. The operator kneels over the patient, straddling his thighs. The thighs are grasped just below the hip joints at the pubis and the hips are lifted from 10 to 12 inches and then lowered to the ground. This procedure is alternated with the Schafer maneuver. Such a cycle is repeated from 10 to 12 times a minute.

A resuscitator which supplies air drawn from the atmosphere cannot be used in the contaminated area. A necessary modification is the inclusion of a gas-mask canister in the air-intake channel. Portable bellows-type resuscitators so modified can be used for this purpose but the weight of such items (about 5 pounds each) precludes the possibility that more than a few of them can actually be transported to and used on casualties during combat.

### TREATMENT

The treatment of anticholinesterase poisoning is based on blocking the effects of accumulated acetylcholine by giving atropine and on appropriate symptomatic therapy. In patients with mild exposure the intermittent bronchospasm is readily relieved with small doses of atropine.

Patients with moderately severe exposure suffering from bronchospasm, dyspnea, cyanosis, bradycardia and hypotension should be given 2 mg. of atropine (intravenously if possible, otherwise intramuscularly) every 2 to 3 minutes until these symptoms are relieved and such signs of atropinization as dryness of the mouth appear. It is amazing how much atropine some of these patients tolerate without showing any signs of atropinization. Smaller parenteral or oral doses of atropine must be administered every few hours thereafter for at least several days to maintain atropinization because the poisoning is far more persistent than the atropine effects. Some of these patients will show muscular twitching or clonic-tonic convulsions. The convulsions if not adequately controlled by atropine may be controlled by the intravenous or intramuscular injection of 1 gram of trimethadione in a 20 percent solution every 15 minutes up to a maximum of 5 grams. This drug has the advantage of not depressing respiration. Such barbi-

curat as a phenobarbital sodium and thopental sodium may also be used for the control of convulsions but they have the disadvantage of depressing respiration. Apprehension, in a patient not receiving a barbiturate for the control of convulsions may be allayed by 0.1 gram of pentobarbital sodium by mouth, repeated in 30 minutes and then very 6 hours. If necessary Smoking must be avoided in the early stage of treatment because it aggravates the respiratory and gastrointestinal symptoms of nerve-gas poisoning.

Patients with severe exposure suffering from profound anoxia and intermittent almost continuous convulsions followed by flaccid paralysis present a very grave and difficult problem. Atropine is dangerous for patients with severe and prolonged anoxia. The inhibition of the heart from vagal control with the attendant increase in work by the heart muscle in the face of severe and prolonged anoxia may lead immediately to ventricular fibrillation and death. The administration of atropine should be delayed in this condition until the lungs have been ventilated and the heart has made some recovery from anoxia. Because the chest is collapsed by flaccid paralysis of the muscles of respiration positive pressure method of resuscitation must be used to ventilate the lungs. Any available type of powered respirator (e. g. iron lung) is also satisfactory for this purpose. Resuscitation may be needed for an hour or more before spontaneous respiration is restored. As soon as the anoxia is overcome atropine should be given intravenously or intramuscularly in full dosage until signs of atropinization appear. Maintenance doses of atropine must be given orally or parenterally for several days thereafter because the effects of nerve-gas poisoning are much more persistent than atropine effects. Convulsions are controlled as described above.

Systemically administered atropine does not relieve the ocular effects of nerve gas. A ophthalmic ointment of 2 percent homatropine hydrobromide for mild exposure or of 1 percent atropine sulfate for severe exposure is necessary until good mydriasis is obtained. This usually relieves miosis, eye pain and headache promptly but the procedure may have to be repeated several times as the miosis frequently recurs.

The dosage of atropine recommended (2 mg) is about 4 times the usually expected dose. Care should be taken to avoid atropine poisoning especially in the milder forms of nerve gas poisoning.

#### SUMMARY OF FIRST AID AND TREATMENT

##### *I. First aid measures*

1. Termination of exposure: make casualty removing from contaminated decontaminating known surfaces exposed to contamination by removal of contaminated clothing and equipment.

2 Atropine administration—given as soon as possible after poisoning and repeated as necessary

3 Artificial respiration—in paralyzed casualties if practicable

*Symptomatic treatment*

1 Anticonvulsive drugs—trimethadione or thiopental sodium to control convulsions not controlled by atropine

2 Sedative drugs—pentobarbital sodium to allay apprehension

3 Mydriatics—atropine or homatropine to overcome miosis

## BOOK REVIEW

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The 1950 Year Book of Physical Medicine and Rehabilitation (December 1949-January 1951) edited by *Frank H. Krusen*, M.D., Professor of Physical Medicine Mayo Foundation Head of the Section on Physical Medicine and Rehabilitation Mayo Clinic; Associate Editors: *Earl C. Elkins*, M.D., Assistant Professor of Physical Medicine Mayo Foundation Consultant in Physical Medicine and Rehabilitation Mayo Clinic and *George G. Deaver*, M.D., Professor of Clinical Rehabilitation and Physical Medicine New York University College of Medicine Director of the Department of Physical Medicine and Rehabilitation Bellevue Hospital 328 pages illustrated. The Year Book Publishers Inc. Chicago Ill. publisher 1951. Price \$5.

This book should be in the library of every physiatrist physical therapist and occupational therapist. In this small volume the editors have compiled in abstract form the best of the 1950 literature concerning physical medicine and rehabilitation. The foreign as well as the domestic literature has been included in this book. There are many footnotes written by the editors. These contain pertinent comments by the experts evaluating the relative merits of procedures reported. Thus readers can get some help in determining which of the articles make a real contribution to this specialty. Of special interest is the section on "Physiologic Considerations." The work being done in basic neuromuscular physiology is most interesting. Great advances in technique based on these studies can be expected within the next few years.—Lt Col J. N. Schaeffer U.S.A.F. (MC)



## BOOK REVIEW

The Architecture of Normal and Malformed Hearts, A Phylogenetic Theory of Their Development by Dr. Alexander Spitzer, Late Professor of Anatomy, The University of Vienna. With Summary and Analysis of the Theory by Maurice Lev, B. S., M. D., Associate Professor of Pathology, University of Illinois Hospital, Chicago, Ill., and Aloys W. V. M. D., with Foreword by Ott. Sepp, M. D., Pathologist, Mihail Res. Hospital, Cluj, Cluj Prof. of Pathology, University of Illinois, Coll. of Medicine, Chicago, Ill. 145 pages; illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1951.

This translation of Spitzer's monograph is an important contribution to the study of congenital heart disease. Spitzer's outstanding contribution is in the embryological basis of congenital heart disease. It is surprising that the work of translation was not accomplished long before this for the nonreader of German. One can realize the difficulties which the translators encountered for sometimes entire pages appear very complicated and must be read to be understood. Spitzer suggested phylogenetic rather than an ontogenetic explanation of the development of the malformed heart. His views are fully and exhaustively supported. This book is an extension of his original ideas concerning the development of the normal mammalian heart. The basic assumptions that he develops are (1) that the mammalian heart is derived from low vertebral forms, (2) that this evolution is a purposeful adaptation on the part of animal life, (3) that in phylogeny hydrodynamic factors play a role in the development of the circulation, the basic factor being progressive increase in blood volume and pressure, and (4) that in ontogeny phylogenetic forces are inherited in biologically organized form. He relates to this the changes in respiration, the governing factor of the circulatory change.

The translators have prepared their own summary and analysis of Spitzer's theory, and the reader may find the book easier to understand if he begins with this part and later reads the first portion which is the translation of Spitzer's writings. The translators' criticism of Spitzer's theory is that it fails to explain the absorption of the bulbous part into the wall of the transposition that occurs. The translators have modified the theory so that it will explain the development of the malformed heart. Their failure to include Spitzer's special description of separate instances of malformations is a serious omission. They thereby lose the opportunity to produce a complete translation.

This book will delight the embryologist, the anatomist, and all those interested in the problem of congenital heart disease.

—Commander H. A. Lyons, MC, U. S. N.

# Evolution of Medical Air Transport Policies

Joseph A. Baird, Colonel, U S A F (MC) (1)

THE transportation of sick and wounded by air is now an everyday occurrence familiar to all and generally acceptable both in theory and in practice. Where speed, safety and comfort are desired air transportation is the method of choice. This very commonplaceness, this ready human adaptation to the newest form of personal communication tends to make us overlook not only its implications for the future and its impact on the present, but also its evolution from the past. Just as commercial air travel has not always been the method of choice, so with medical air transport. The history and development of the latter parallel that of the former and both have depended on the growth of the airplane from a primitive craft for military uses only to one of manifold uses and designs.

In its early days the airplane was built primarily for speed. Comfort and safety were lesser considerations. The selection of a patient for transportation by air was made with the thought in mind that air travel was a calculated risk to be undertaken only because the patient had otherwise a small chance to survive. Air transport was the lesser of two evils. There was little knowledge of the effects of air travel on clinical conditions. The ambulatory patient was placed in an open cockpit, exposed to noise, wind blast, and temperature extremes. The bed patient was either propped up in a similar situation or the aircraft hastily modified to make room for a litter.

Economy of time was assured from the beginning of medical air evacuation but research and development continued endlessly to attain greater speed and a wider range of operation and at the same time to increase the safety of the operation. Military aircraft were built primarily for fast mobile firepower. This resulted in the sacrifice of safety. When the goal of safety was finally reached it was a composite result of design, construction, operation, meteorology and communications. With safety came increased use of aircraft for passenger travel and, consequently, patient travel. It became possible to transport both litter

(1) Headquarters, Continental Division, MATS, Kelly Air Force Base, Tex.

and ambulatory patients over long distances speedily and safely. These conditions were achieved late in World War II and continued to exist as prime requisites for air evacuation until about 1949. Then for the first time it became possible to ask for and receive additional comfort features in aircraft.

I am not implying that these comfort items had not been previously envisioned by workers in the medical air evacuation field. Pilots and ground personnel, nurses, stewards, medical technicians, traffic managers, and doctors had all dreamed and struggled to improve the patient evacuation service. They were impeded by many things such as narrowness of concept and thought, limitations on funds and personnel, lack of priority support, and a defined mission.

When in 1948 Military Air Transport Service (MATS) was organized and began a planned evacuation system for the Military Establishment, there was some liberalization of concept. Increased intraorganizational command support and a definite mission; but funds and personnel were still lacking. The formation of policy was difficult and slow because no one was quite sure just what kind of a policy was needed or wanted. MATS was organized as the primary agency for air travel of patients but rail, ship, ambulance or other means of transport were to be used if the shipping agency favored those means. Within the Air Force itself there was a casual attitude toward air evacuation. It was something to be used if time permitted and aircraft were available but whenever another mission involved the aircraft concerned they were diverted from air evacuation and the patients were moved by other means. This lack of reliability was the chief objection to the medical use of air transportation.

In 1949 acting on the recommendation of the Surgeons General of the Army, Navy, and Air Force it was finally decided that the primary method of choice for transporting patients worldwide would be air and that MATS would be the transport agency. This indicated sufficient means, Department of Defense support, high priority and well-defined mission, and that a definite policy could be conceived and published by the responsible agency.

Although Headquarters U. S. Air Force retained the policy-making prerogative by regulation most of it was delegated to the Commander, MATS. Within the limits of the mission defined in broad general terms by the Department of Defense and the more specific but still rather general limitations of policy, personnel, equipment and funds laid down by Headquarters USAF, the Commander of MATS, as represented by his Air Surgeon, is responsible for prescribing the detailed policies for Air evacuation. To help him accomplish this the Air Surgeon, MATS, has his regular staff plus a Navy medical officer who is his deputy. This officer aids in the formulation of policies especially those relating to the employment of equipment and personnel of the Navy Air Transport Squadrons within MATS.

One of the missions of MATS is the movement of all patients by air for the Department of Defense with speed safety and comfort. Specifically it is restricted to transportation and medical care aboard aircraft en route. At the originating or RON (remain-over-night) hospital after the responsible medical officer decides which patients will be moved and what method of travel is desirable, he coordinates with the air evacuation liaison officer and together they decide when the move will be made. The local medical regulating officer or the Armed Services medical regulating office decides each patient's destination.

The air evacuation mission of MATS is therefore predominantly a medical service responsibility. Virtually all other staff sections are involved in the success of the mission: operations and traffic more so than others, but the Air Surgeon of MATS is responsible for the general supervision and efficient functioning of all the interested elements and sections. The Air Surgeon thus has an interest in such matters as personnel, public relations, preceptor training, supply, equipment development, procurement organization and plans including mobilization, war and disaster plans. In addition to this internal or staff supervision and liaison, the Air Surgeon is charged with external liaison with all using agencies. This includes not only Department of Defense and Veterans Administration hospitals but also liaison with the Surgeons General of the Army, Navy and Air Force, with the School of Aviation Medicine, with the Aeromedical Research Laboratory, with the Army Medical Field Service School, and with the surgeons of major military areas and commands. The major policy then is that air evacuation is a medical responsibility.

How are policies developed? The Air Surgeon MATS brings together the experience of his colleagues and his predecessors and studies history. By these means he can develop workable policies. Many others will be evolved from technicians, ideas and nurses and pilots' reports of discrepancies or unsatisfactory performance that reach him from the operational level. Still others come from a study of published reports of the Aeromedical Laboratory and reports on such subjects as the effect of air transportation on clinical conditions or studies on drugs to prevent airsickness prepared by the School of Aviation Medicine. After he has received and analyzed these ideas and found them to be applicable generally, he can make immediate corrections within his own organization but because MATS is a command on a level subordinate to the Department of the Air Force but doing a job for commands on a level with the AF, any changes or corrections in policy will not become effective unless and until they are published in a joint regulation. A typical example of such a joint regulation is AFR 160-52. It is also known to the Army as AR 40-535 and to the Navy as CNO Ltr 20P56.

This regulation had its inception as a MATS regulation which was published in March 1949 but it was only partially effective until its publication as a joint regulation in March 1950. It is a declaration of some

of our policies and it clearly defines the responsibilities of the using agencies and transporting agency. Another joint regulation which, when published, ended a long period of unhappiness for medical supply and property officers is AFR 67-40 (AR 40-538; BUMED Cir Ltr 50-92). It has solved the complicated problem of accounting for blankets, liners, sheets, pillows, and other items accompanying patients. A third joint regulation is AFR 76-15, known also as DA Pamphlet 29-16 and CNO Ltr 08P05. This regulation is primarily intended to define personnel eligible to travel on MATS aircraft. The portion of interest—a matter of policy—is paragraph 5a (9) which states that any person may be transported in case of an emergency. In order to complete emergency flights, theater base commanders may use theater aircraft or MATS aircraft.

These three joint regulations have greatly helped solve external problems, though there remain many internal ones for which policies are yet to be made. The policies are of primary concern to the transport agency and they concern such matters as organizational structure, personnel training, operations, traffic plans, including war plans, and actual medical care while in flight.

The formulation of policy and its publication to every member of an organization is fundamental to the success of the mission of that organization. Although patients were transported by air from the earliest days of aircraft, and although air evacuation progressed through those years from daring individual flights to routine flight of thousands of patients, over thousands of miles, development of a real and useful policy has followed definition of mission, fixing of responsibility, revision of concept, declaration of priority, and assurance of complete support.

# Medical Experiences in Korea

Donald E. Carle, *Colonel, MC U S A (1)*

**I**N this article certain aspects of the Army Medical Service as it functioned in the early period of the Korean campaign are presented. The scope of the subject matter is limited to selected observations based on my personal experiences while serving as the Second Infantry Division Surgeon.

## MEDICAL DOCTRINE

Hostilities in Korea have generated much discussion among officers of the Army Medical Service regarding the validity of the basic medical doctrine now being taught in the various service schools. There are those who insist that the whole structure of current military-medical doctrine should be re-examined with a view to incorporating a number of radical changes on the premise that recent medical service developments in Korea indicate the need for such revision. My personal experiences and observations in this connection have provided no basis whatever for questioning the soundness of medical doctrine as presently taught in the service schools.

In my opinion those who question the validity of the doctrine misinterpret its intent and purpose. An analysis of many points of objection raised by medical personnel regarding doctrine invariably reveals a type of evaluation which fails to take into account the fact that flexibility is the keynote of the current teaching. The doctrine underlying modern military medical procedures is not intended to be inflexible. The primary purpose rather is to establish certain basic military-medical principles. On such a foundation medical personnel engaged in rendering field medical service may elaborate, improvise, and adapt whatever medical means is at hand to the specific demands imposed by the local medical situation, terrain and weather factors, and the existing tactical position. In Korea our unusually long ambulance runs were regarded by some medical officers as bordering on the unorthodox. Moreover the minor shuffling of transportation equipment between local medical units in order

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(1) Div 10 Surgeon, Second Infantry Division, July 1950-January 1951.

to achieve a more efficient functional arrangement to meet a specific situation was often regarded with great misgivings. Changes of this nature do not, in any sense invalidate basic medical doctrine. They merely represent an extension of the principle of conversion of resources to meet a given set of circumstances.

### ORGANIZATION AND EQUIPMENT

The Table of Organization and Equipment (TO/E) for the medical detachment of a divisional headquarters provides for personnel and equipment sufficient only for the establishment of one medical installation. It is however common policy to establish a forward and a rear division command post and sometimes a third command post known as 'division advance'. Because any appreciable intervening distance makes it extremely difficult if not actually impossible to render efficient medical service with one functional unit for the two or three command post elements an informal arrangement is usually made to borrow from the medical battalion a medical officer, one enlisted technician and sufficient equipment including appropriate types of medical field chests to allow for the establishment of two functional aid stations. One station is located at the division rear command post and one at the division forward command post.

Although no provision is made in the present TO/E of the medical battalion for the personnel and equipment required to operate a neuropsychiatric treatment center as such the flow of neuropsychiatric casualties in one Korean action was so great as to make it virtually mandatory to establish such a divisional center. During the critical days of the Nakdong River defense (August and September 1950) replacements for those personnel evacuated rearward of divisional boundaries were almost nonexistent. Therefore a policy was adopted with the approval of the Surgeon Eighth Army to hold all neuropsychiatric patients who were thought to be salvageable within from 5 to 7 days at division clearing station level. This is much longer than was envisaged in the accepted teaching doctrine of the divisional medical service. There was however from the practical viewpoint, no alternative but to hold them, if the Division's strength was to be conserved. The most forwardly located divisional clearing station operated, in addition to its normal function, as a neuropsychiatric treatment center although its TO/E did not provide the necessary augmentation. Also no other neuropsychiatric treatment centers were available in Korea at that time. In establishing the center it was necessary to secure additional tents and other field equipment. When the need for the center ceased to exist its personnel were redeployed to various medical sections of the medical battalion.

Another example of deviation from specific TO/E provisions was the occasional employment of dental officers in tasks or missions other than strictly dental professional duties. In like manner the division

neuropsychiatrist may at times also be called on to aid and assist other medical officers in the care of sick and wounded when the neuropsychiatric patient load is small.

The distances normally existing between the division surgeon's headquarters and the medical battalion commander's command post, coupled with the difficulties inherent in combat communications usually compels the informal borrowing of one officer and one driver from the medical battalion for constant liaison purposes. In a practical sense these two persons functionally become a part of the division surgeon's office sleeping eating and moving along with the section as its location changes.

Although the foregoing examples of using the means at hand to meet the exigencies of the moment are not typical of extreme deviations in the matter of redistributing personnel and equipment, they do serve to illustrate the fact that it is necessary occasionally to require the maximum use of all Medical Service officers regardless of their corps designation and also to effect changes in the normal employment of equipment during combat.

Some degree of reluctance on the part of a few supply agencies to cooperate in going beyond the authorized basis of issue of equipment is to be anticipated. How well medical officers overcome the objections of those unduly bound by the literal letter of TO/E provisions is a matter which primarily involves the initiative and resourcefulness of the officer concerned.

### FORWARD AREA SURGERY

In Korea experience amply demonstrated the necessity for having young surgeons (3150 D's and 3150 C's) within the division. The professional activities of these surgeons at division clearing station level directly saved the lives of many soldiers requiring immediate major operations. The field situations encountered in Korea were unusual with regard to distances between clearing stations and the nearest army mobile surgical hospital. Abnormal transportation difficulties also added to this particular problem.

### MEDICAL FIELD TRAINING

If any question remained as to the practical value of field training for all Medical Service personnel the experiences of medical officers in Korea may be relied on to dispel any doubts in this regard. No attempt will be made to relate specific examples of needless burdens as well as risks imposed on a number of medical officers in Korea solely because they lacked adequate field training. Suffice it to say that all Medical Service officers and enlisted personnel regardless of professional specialty designation or technical qualifications should undergo intensive medical field training prior to assignment to any theater of operations.



Night operational training is of inestimable value to medical troops functioning under battle conditions. In the Far East Command most medical units performed their duties admirably during daylight hours. Until they gained experience, however, many of the units were woefully inadequate when it became necessary to conduct operations at night. This was manifested by the confusion attending the establishment of stations, closing of trails, and movements forward or rearward during hours of darkness. In many such situations a working knowledge of map reading, proficiency in the use of the compass, and the old backwoodsman's sixth sense of direction often constituted the difference between life and death for medical personnel separated from the elements of combat troops, and also in other emergencies where it was necessary to seek cover in the mountains.

Newspaper and other reports emanating from the Far East Command have made common knowledge of the fact that display of the Geneva Cross affords no protection to United Nations medical personnel engaged in Korean operations. To the contrary, such medical elements routinely point out or otherwise obliterate the red crosses on unit ambulances before taking the field in support of combat troops. Inasmuch as enemy forces in Korea disregarded the noncombative role of the Army Medical Service, it was necessary to discourage the wearing of the Medical Service braard.

### FIELD MEDICAL REPORTS

Certain improvisations relative to field medical records and reports were adopted in Korea. For example, it was soon apparent that the statistical section, basically part of the division surgical office, could function more efficiently if located at the clearing station. Consequently personnel of the statistical section were informally placed with the medical battalion where they functioned as though they were fully assigned personnel. This proved to be the logical location for section purpose inasmuch as the center of flow of casualties and report pertaining to casualties occurs at the base clearing station or point (2).

**Editor's note:** Although under certain circumstances the statistical section of the division surgeon may be able to perform its work relating solely to the collection of data and report more effectively when it is physically located at the clearing station, we cannot deem that such an arrangement should be normally prescribed, would be so taking into account few of the errors which the statistical section, part of the surgeon's staff, supposedly provide to the surgeon. The answer to the question of such arrangements better under given set of circumstances depends on number of factors, including the individual capabilities of the personnel assigned to the statistical section and of the personnel with records and report responsibilities assigned to the medical battalion and the regimental and other medical detachments; the extent to which the statistical section performs administrative and logistical functions; the extent to which the division surgeon will rely on the statistical section to provide him with facts, figures, and analysis in the planning and operation of the division medical service.

At irregular intervals sporadic outbreaks of certain diseases made it expedient to originate a special report known as the Able Baker Charley report. This report was required from the three clearing platoons daily and was transmitted by the most convenient means. It was materially simplified especially when given by radio or telephone because prior designation of a certain disease as Able another disease as Baker and still another disease as Charley resulted in quick reporting e g Able-10; Baker-4 Charley-3. The report was discontinued when the incidence of these particular diseases fell sufficiently as to be no longer of more than passing significance.

### PROPERTY EXCHANGE PROBLEMS

During early operations in the Far East Command property exchange frequently led to serious complications. In certain situations it broke down completely. Adding to the normal difficulties incident to battlefield property exchange were the diverse methods such as hospital train, C 47 plane and helicopter employed by Army to evacuate casualties. In many instances no similar items of medical property were made available for exchange by the Army evacuating agencies to the division medical battalion. In critical situations about 350 patients were sometimes evacuated to rearward areas by C 47 planes. These patients were transported in division ambulances to the airstrip. Often at the airstrip there were no litters, blankets or splints available for property exchange. It required only a few days of intensive evacuation by plane or hospital train without property exchange seriously to deplete the division's stock of these items. This brief comment regarding property exchange is made in order to re-emphasize the importance of early planning and the implementation of such planning in connection with the establishment of medical supply dumps in strategic theater locations. Failure to accord this subject the consideration it merits will invariably result in an accumulation of needless obstacles affecting the chain of evacuation.

### COLD WEATHER PROBLEMS

With the advent of winter weather in Korea some difficulties were experienced in connection with plasma and medications in solution tending to freeze because a sufficient number of stoves were not initially available to permit their use in medical supply holding agencies. Experience revealed that in cold weather a minimum of 5 blankets per patient were required to prevent the patient from going into shock. This number of blankets per patient was in excess of early planning estimates and therefore required upward revision in stock levels. It was found also that the command post type tent used by battalion aid stations is not suitable for winter operations because of insufficient patient capacity. Therefore squad tents were substituted, providing much better shelter for casualties awaiting medical treatment. As winter progressed at least one fuel-burning stove and sometimes two, were necessary to warm each squad tent containing casualties. These additional items were secured through the cooperation of the division quartermaster. Winter weather

made the use of the unmodified jeep litter ambulance impractical. These vehicles afforded the patients no practical protection from the elements. To offset this situation, many medical units improvised a canvas or other covering which was suspended over the back of the ambulance. Such improvisation could not be expected to provide an ideal solution, but they did offer some degree of protection to the patient while in transit.

### USE OF HELICOPTERS

The feasibility of using helicopters within the Infantry division for evacuation purposes was firmly established early in the Korean campaign. This type of aircraft proved readily adaptable to the evacuation of casualties in the field. They were ideally suited to one example for transporting casualties suffering from severe abdominal or chest wounds who could not have withstood the rigors of a long jolt in an ambulance. In the first stages of the campaign it was possible to borrow at times the much needed helicopter service from the U. S. Marine. The U. S. Army headquarters was successful in securing several of these aircraft from the Air-Se Rescue Squadron. These were made available to the division on call when they were not otherwise engaged. Such an arrangement while not to be unduly discredited is not completely satisfactory because the availability of the helicopter to the division must necessarily fluctuate widely with each significant change in field tactical situation. Helicopters proved irreplaceable in the evacuation of wounded personnel who had been cut off from the remainder of the division. In one situation alone more than 40 casualties were successfully evacuated by this means. The far-reaching significance of this action lies in the fact that in no other manner could the wounded have been reached at the time.

In situations where helicopter service could not be obtained and there were no other available means, single patients were brought to medical installation by L-5 planes, but the requirement for liaison-type aircraft and the limited patient capacity of this plane materially reduced the effectiveness of this method of evacuation.

The unanimity of opinion among army division and corps surgeons with respect to the capabilities of helicopter to fulfill a critical evacuation function within the division is almost certain to result in the future assignment of a reasonable number of these aircraft to combat divisions for purposes of medical evacuation.

### EVACUATION DIFFICULTIES

In the Far East Command evacuation of casualties was most difficult because of the inadequacy of roads, the extreme distances separating medical installations, and the freezing weather. These factors singly or in combination made it necessary to use every type of transportation with the threat of ration time or other. During the heaviest

tic days of the fighting in the Nakdong perimeter. It was frequently necessary to transport casualties on a straw-covered bed of a 2 1/2 ton truck. Three-quarter ton weapon carriers were also pressed into service as were all other types of rolling transportation which happened to be available at the time. Whenever possible, air evacuation was used by the division in transporting casualties to Army evacuation hospitals in Pusan, but this method was always contingent on the availability of suitable airfields which unfortunately proved the exception rather than the rule.

### TACTICAL EMPLOYMENT

The type of terrain characteristic of Korea directly influenced the tactical disposition of medical installations. Among the first principles to be established in this connection was the requirement that medical installations be located as near as possible to the center of the perimeter of the unit it was supporting.

### LOGISTICAL SUPPORT

Logistical support was difficult to maintain in Korea. As previously indicated, roads were in a deplorable state, often one way, and because of their condition forced motor traffic to move at very slow speeds. In addition, entire areas of the country are without railway facilities. As if further to complicate these difficulties, it was not uncommon in planning operations to see a fine railroad indicated on certain maps, only to learn on further investigation, that no such railway line existed. Such transportation facilities had merely been planned for future construction by the Japanese during their occupation of Korea. The initial securing of the port facilities at Inchon greatly increased the efficiency of logistic support throughout the Korean area, but the advance beyond Pyongyang would have imposed almost insurmountable difficulties in maintaining adequate logistical support to forward elements had it not been possible to capture and restore the large airfields at Pyongyang which were capable of accommodating C 47's and heavier aircraft.

### CONCLUSIONS

Military-medical doctrine as currently taught in the various service schools continues to retain its basic validity in the light of field medical experiences encountered in the Korean conflict.

The medical detachment of the infantry division headquarters should be augmented by the assignment of one additional medical officer and additional medical field equipment in order to facilitate the establishment of two functional aid stations to serve division forward and rear command post elements.

The medical service of the infantry division is hampered by the lack of authorized equipment with which to set up a neuropsychiatric treatment center when the need arises. At present the necessary tentage

litters and other supplies must be borrowed from the various clearing company platoons thus reducing their present capacity.

A shortage of medical officers and other factors will frequently make it necessary under field conditions temporarily to use Medical Service personnel in other than their designated professional capacities.

When a campaign is conducted under the type of terrain weather and transportation difficulties encountered in Korea the presence of one medical officer (3150-C) in each of the clearing platoons often means the difference between life and death for certain patients with chest or abdominal wounds.

All Army Medical Service personnel should receive intensive field training with the least delay on the tactical and administrative aspects of field operations prior to assignment to a theater of operations.

The statistical section basically a part of the division surgeon's office may be operationally more efficient when located at the clearing station level (2).

Early planning and its actual implementation in regard to establishment of medical supply dumps is essential to the operation of a satisfactory system of property exchange.

Under the type of terrain and transportation difficulties found in Korea the medical service of the infantry division would be greatly improved through the organization of a segment of light aircraft section. This section should consist of not less than three helicopters and two L-5-type airplanes.

Medical officers operating a medical service under combat conditions invariably are confronted with a number of acute situations the solution for which may only be found in individual initiative resourcefulness and enterprise.

# Chemosurgery

Gordon H. Ekblad, *Captain, M.C. U. S. N.* (1)

THE chemosurgical technic of treating cutaneous and other accessible cancers as developed by Mohs (2, 15) is an exceptionally reliable method for the treatment of these malignancies. Chemosurgery has been used in 25 selected patients with skin cancer at this hospital in the past 2½ years. Although the number of patients treated and the duration of the study made are not sufficient to make these cases of statistical value they are presented to familiarize service personnel with this technic and to show that this type of work can be carried out in spite of the frequent changes in the technical staff which occur in the military service. Some modifications in Dr Mohs' technic for the preparation of the histopathologic sections have been made in order to simplify the procedure. Recurrent skin

(1) L. S. Naval Hospital, Oakland, Calif.

(2) Mohs, F. E.: Chemosurgical treatment of melanoma, microscopically controlled method of excision. *Arch. Derm. & Syph.* 62: 269-279, Aug. 1950.

(3) Mohs, F. E.: Chemosurgery of cutaneous malignancy. *California Medicine* 71: 173-177, Sept. 1949.

(4) Mohs, F. E.: Chemosurgical treatment of tumors of parotid gland; microscopically controlled method of excision. *Ann. Surg.* 129: 381-393, Mar. 1949.

(5) Mohs, F. E.: Chemosurgical treatment of cancer of extremity and trunk, microscopically controlled method of excision. *Arch. Surg.* 57: 818-832, Dec. 1948.

(6) Mohs, F. E.: Chemosurgical treatment of cancer of skin; microscopically controlled method of excision. *J. A. M. A.* 138: 564-569, Oct. 23, 1948.

(7) Mohs, F. E.: Preparation of frozen cuts for chemosurgical technique for microscopically controlled excision of cancer. *J. Lab. & Clin. Med.* 33: 392-396, Mar. 1948.

(8) Mohs, F. E.: Chemosurgical treatment of cancer of eyelid; microscopically controlled method of excision. *Arch. Ophth.* 39: 43-59, Jan. 1948.

(9) Mohs, F. E.: Chemosurgical treatment of cancer of face; microscopically controlled method of excision. *Arch. Derm. & Syph.* 56: 143-156, Aug. 1947.

(10) Mohs, F. E.: Chemosurgical treatment of cancer of ear; microscopically controlled method of excision. *Surgery* 21: 605-622, May 1947.

(11) Mohs, F. E.: Chemosurgical treatment of cancer of ear; microscopically controlled method. *Arch. Surg.* 53: 327-344, Sept. 1946.

(12) Mohs, F. E.: Chemosurgical treatment of cancer of lip; microscopically controlled method of excision. *Arch. Surg.* 48: 478-488, Jan. 1944.

(13) Mohs, F. E., Seering, E. L., and Schmidt, E. R.: Conservative amputation of gangrenous part by chemosurgery. *Ann. Surg.* 114: 274-282, Aug. 1941.

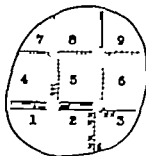
(14) Mohs, F. E.: Chemosurgery; microscopically controlled method of cancer excision. *Arch. Surg.* 42: 279-293, Feb. 1941.

(15) Mohs, F. E., and Geyer, M. F.: Pre-excisional fixation of tissues in treatment of cancer in rats. *Cancer Research* 1: 49-51, Jan. 1941.

cancer which were previously treated with x-ray and/or operation as frequently amenable to no type of treatment other than chemosurgery. It is desirable that all large service hospitals treating skin cancers be equipped to do this type of work.

### TECHNIC

The chemosurgical treatment of case 1 is described step by step to show the exact procedure used. A saturated solution of di- or trichloroacetic acid is first painted on the skin of the involved area. This is necessary because zinc chloride paste will not penetrate the intact keratin layer. The acid is applied until the keratin layer turns a dead white. Zinc chloride paste made up of 34.5 cc. of a saturated solution of zinc chloride, 10 grams of sanguinar canadensis and



— top edge marked with red (mercurochrome) dye.  
 — right edge marked with blue (household bluing) dye.  
 — positive for cancer cells.

Figure 1. Diagram showing a small section of the treated area of case 1 to demonstrate how sections are demarcated and marked if positive for cancer cells.

40 grams of stiburate is then applied to this area. The depth to which fixation is desired can be varied from about 1 mm. to over 1 cm., depending on whether the paste is applied lightly or in a thick layer. The paste is then covered with a thin layer of cotton over which a layer of petrolatum gauze is placed to keep the dressing from drying out. This in turn, is covered with gauze and adhesive tape to keep the dressing in place. The zinc chloride dressing is left in place over night and removed the next morning. There is little associated pain with this procedure although some patients may require an analgesic. The involved tissue is thus fixed in situ so that no anesthesia is necessary for the excision of this area.

The fixed tissue is excised in convenient sizes as shown in figure 1 and under surface of each section is cut for histopathologic examination. The areas positive for cancer are re-treated with zinc chloride paste before and these areas are again sectioned on the following day. If the sections are negative for cancer the treatment is complete. Incisions are made through the fixed tissue only close to the

junction with living tissue but far enough away so that there is no associated bleeding or pain. Every section must be complete as other wise it will be impossible to tell whether the missing areas contained cancer or not. The microscopic control permits conservative treatment because only a few millimeters of tissue beyond the carcinomatous tissue need be removed. A biopsy specimen from all patients is sent to the laboratory for confirmation of the diagnosis.

### MICROTECHNICAL PROCEDURE

For complete details of the frozen section technic the reader is referred to Mohs' original article (7). A trained technician makes the frozen sections and when necessary he can train untrained personnel in the method. The only difficulty with the frozen section technic is the time required to develop the manual dexterity which is necessary to make good whole sections of each piece of tissue. Technicians in training start by making paraffin sections using a modified technic. Although this method is not as satisfactory as Mohs' frozen section procedure because it takes about 4 hours to complete it is easier to teach to new technicians. The slides prepared by this method are probably of slightly better quality than those prepared by the frozen section method. As the technicians become more adept at handling the tissue preparations they use the frozen section technic.

### QUICK PARAFFIN BLOCK TECHNIC

The sections as they are excised are already fixed and no further fixative is necessary. They are placed in two changes of dioxane allowing one-half hour for each exposure. The sections are next placed directly in melted paraffin (or Fisher's tissue mat) and placed in an incubator for about 1 hour. Sections are blocked in the usual manner except that meticulous care must be exercised to insure that the section is placed absolutely flat. Two stylets from spinal puncture needles are used to place the sections evenly. One corner of the section is anchored with a stylet and held while another corner is anchored with the second stylet. The first stylet can now be removed and placed on the third corner and so forth. Sections from 8 to 12 microns thick are then cut on the microtome and are floated into a warm water bath and mounted on glass slides that have been coated with egg albumin. They are returned to the incubator for half an hour then stained with hematoxylin and eosin according to the technic described by Mohs (7).

### ILLUSTRATIVE CASES

*Case 1.* Figure 2 shows a lesion measuring 3.1 by 1 cm. which had recurred after surgical excision 18 months earlier. It was in the operative scar and extended upward over the temporal area adjacent to the left ear and onto the anterior lobe of the ear. The superior sulcus of the ear was also involved. Figure 3 shows the defect present at the completion of chemotherapy. Besides extending onto the anterior portion of the ear which was suspected clinically the cancer was





Figure 2 (case 1), 12 November 1948. Figure 3 (case 1), 24 November 1948.  
Figure 4 (case 1), 6 February 1950.

found to extend inferiorly in the excisional scar about 1 cm. more than was expected. Figure 4 shows the appearance 13 months after chemosurgery. Two and one half years after chemosurgery there was no recurrence.

**Case 2.** Figure 5 shows a basal cell carcinoma measuring 5 by 3 cm. of 5 years' duration involving the right ear and preauricular area. Figure 6 shows complete removal of the cancer after 13 dissections. The external auditory canal was involved to a depth of about 5 mm. The facial nerve was not interrupted. Figure 7 shows complete healing.

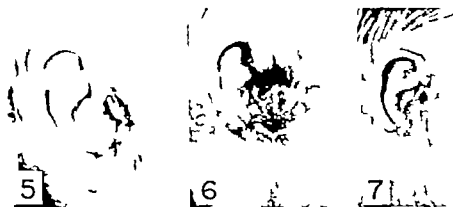


Figure 5 (case 2). 24 January 1950. Figure 6 (case 2). 10 March 1950.  
Figure 7 (case 2). 26 April 1950.

**Case 3.** A primary squamous carcinoma of the left preauricular region was treated in February 1947 by x-ray. Regional metastases occurring in April 1947 were treated with x-ray from June 1947 to May 1949. A total of 27,000 r were given. On admission a crater ulcer of 8 months' duration (fig. 8) was present below the left ear. It measured 37 mm. by 33 mm. and was 29 mm. deep. A woody hardness surrounded the area and measured 8 cm. by 6 cm. The external carotid artery could be seen to pulsate at the base of the ulcer. The left facial nerve had been paralyzed for 4 weeks. A postradiation fibrosis of the left mandible and attached muscles had been present for 6 months. The patient had had difficulty in swallowing for 5 months and could only eat soft and liquid foods. Thirty-three chemosurgical dissections were performed (fig. 9). The positive sections extended deep to the external and internal carotid arteries and involved the transverse process of the atlas. The pharynx was penetrated at one small area but promptly healed. Figure 10 shows the healed lesion following plastic repair. Metastases recurred in the body of the atlas in November 1950, 16 months after chemosurgery. This was followed by a rapid downhill course and death 6 weeks later. The autopsy showed extensive necrosis and carcinomatous invasion of the atlas.

This was one of two failures in this series.



Figure 8 (case 3), 22 July 1949, Figure 9 (case 3), 18 July 1949, Figure 10 (case 3), 14 April 1950

*Case 4.* This patient admitted on 26 July 1950 had a basal cell carcinoma of the left cheek measuring 24 mm. by 34 mm. of 5 years duration. Numerous areas of keratosis in adjacent areas made it difficult clinically to determine the extent of the lesion. Chemosurgery was completed in 5 dissections from 1 to 5 August. By 18 September healing was complete leaving the patient with a mild ectropion of the left lower eyelid.

*Case 5.* This patient, admitted on 18 January 1950 had a pigmented basal cell carcinoma on the left side of the nose measuring 15 mm. by 8 mm. of 5 years duration. The lesion was excised surgically on 24 January. Multiple biopsy specimens encircling the excised area showed an incomplete removal. The treatment was changed to chemosurgery which was completed in 5 dissections from 29 January to 2 February. By 14 March the lesion had healed and 6 months later there was no evidence of recurrence.

*Case 6.* A lesion of the nose was surgically removed in 1942. It recurred in 1946 and has been growing slowly. The biopsy specimen showed squamous cell carcinoma. A total of 5 100 r was given between 21 December 1949 and 9 January 1950. Healing was slow and by 1 August there was evidence of recurrence. Chemosurgery was completed in 8 dissections from 15 August to 11 September. Daily sections were not made because a partial hemiplegia was present as a result of 5 previous cerebral vascular accidents. Because of almost complete destruction of the nose the patient was fitted with a prosthesis.

*Case 7.* A biopsy specimen taken on 2 May 1950 from an area of scarring and crusting measuring 25 mm. by 18 mm. in back of the left ear showed basal squamous cell carcinoma. This area had been treated with radium in 1936 and 4 recurrences had been treated with excision or electrodesiccation. Chemosurgery was completed in 2 dissections. The lesion healed promptly and after 7 months there was no evidence of recurrence.

*Case 8.* This patient first developed a basal cell carcinoma lesion on the inner canthus of the left eye. This was excised in 1943 but recurred in May 1945 and was widely excised. A recurrence in November 1946 was treated in June 1947 by radical excision including removal of the left eye, most of the contents of both frontal sinuses, the anterior left ethmoidal cells and the anterior sphenoidal cells. Microscopic sections showed involvement of sphenoidal and ethmoidal cells and of the left maxillary sinus. A delayed skin graft was performed in March 1948. A further recurrence was noted in August 1948. Radiation therapy was given in September and November 1948 and in May and June of 1949.

Chemosurgery was started in January 1950. The entire nasal cavity was found to be involved except for the interior of the right maxillary sinus. The medial wall of the right orbital tract was involved in its

entirety. The orbital plate here was not present it having been destroyed by cancerous extension by roentgen therapy or by previous surgical removal. The cancerous area did not extend into the eye muscles, and this entire area of involvement was freed of cancer by chemosurgery. The tissues inferior to the right eye were heavily invaded with cancer and the cancerous area was moved down to the maxillary bone which was also invaded. Treatment here was stopped at this point so that other involved areas might be treated. The sphenoidal and the ethmoidal cells were involved and were cleared of cancerous areas. A small opening in the dura over the left ethmoidal cells was produced during chemosurgical treatment. Spinal fluid leaked through this opening for 1 week but no meningeal infection resulted. A small piece of brain tissue was removed during this procedure and was negative for cancer. The frontal sinus which were heavily invaded were cleared of cancer. The left maxillary sinus was heavily invaded with cancer and was cleared down to the nasal cavity which was then left because of the inability to clear the rest of cancer. The base of the skull was removed just inferior and posterior to the frontal sinus. This area was heavily invaded down to the dura which was penetrated in one place with subsequent leakage of spinal fluid for a period of several weeks but no meningeal infection occurred. Treatment was discontinued after 3 chemosurgical dissections because involvement was still extensive and it was impossible to clear all of the involved areas. The patient was experiencing severe pain from the cancerous involvement and the application of the zinc chloride paste aggravated the pain. The fact that there was no hope for cure and the aggravation of pain by the treatment prompted discontinuance of chemosurgery.

This patient received penicillin every 3 hours for 2 1/2 years following plastic operation in May 1947. At the commencement of chemosurgery in January 1950 the injections of penicillin every 3 hours were replaced by injection of procaine penicillin in oil with aluminum monostearate given twice weekly.

This case represents the second of the two failures in this series.

### SUMMARY

Chemosurgical treatment of skin cancers gives a high rate of cure as compared to other methods of treatment. It is a readily available and practical method of treatment for many types of cutaneous and other accessible cancers in which other methods are either impossible or impractical.

### DISCUSSION

Federl E. Mob, M.D.

This article excellently illustrates the type of patient that are particularly suitable for chemosurgical treatment, namely those with cancers which have recurred after various surgical and radiologic

procedures. In other words chemosurgery is an invaluable tool for use in the salvage of patients who otherwise would have relatively little chance of cure. Chemosurgery also may be used to advantage for the removal of early previously untreated external cancer. The rates of cure attained by chemosurgical excision of such lesions are so high that cases of advanced external cancer become almost nonexistent in a community where this treatment has been consistently used for a few years. It is the systematic microscopic control of excision attainable with the chemosurgical technic that accounts for the unprecedented reliability in the treatment of both early and advanced accessible cancer.

Chemosurgical treatment of cancers which involve vital structures is usually contraindicated, but often it is impossible to predict whether or not such structures are involved and it may be necessary to uncover structures which ordinarily would be avoided. By the use of suitable precautions Captain Ekblad successfully removed the large vessels in the neck (case 1) and exposed the dura in the ethmoid area (case 8), but ordinarily it is advisable to avoid these structures because of the danger of fatal hemorrhage from the carotid or jugular vessels on the one hand and because of the danger of meningitis with encephalomalacia on the other.

Although Captain Ekblad's development of the rapid paraffin method to fit his special requirements is commendable in civilian practice where much of the chemosurgical work is performed on an outpatient basis the extra time involved in imbedding in paraffin would be disadvantageous. With frozen sections the patients need wait only a few minutes but it is admitted that the services of a facile and experienced technician is essential to attain the necessarily complete microscopic sections. Relatively few men have taken the time and trouble to master the chemosurgical technic although there is need for this special skill in every large community.

## BOOK REVIEW

*Grouping, Typing and Banking of Blood*, by *Oskar Jervell Pollak M. D.*, Ph. D., F. C. A. P., Director Blood Bank Chief, Department of Anatomical Clinical and Experimental Pathology Director School for Medical Technologists, Quincy City Hospital Quincy, Mass.; Consultant Pathologist, Jordan Hospital Plymouth, Ma. 163 pages; Illustrated, Charles C. Thorn Publisher Springfield Ill., 1951. Price \$5.75.

In his preface the author states that this book is written mainly for Blood Bank personnel. (It) has been written to help technicians, internes and residents who have searched in vain for brief concise informative text on a subject which, when discussed before them by eminent serologists, hematologists and geneticists in highly scientific and detailed manner was simply over their heads. This book will materially help them in their understanding of the blood groups, subgroup, type and subtype. There is a practical discussion of erythroblastosis fetalis and neonatal jaundice on the problems of banking blood. The chapters on administration of whole blood and blood fractions are instructive. At the end of the book there are 10 perforated pages each bearing a chart for the conduct of laboratory tests including testing for syphilis. The usefulness of this commendable device is largely nullified by the arrangement of the charts which read left to right.

Unfortunately the author attempts to provide both an elementary discourse and a highly detailed laboratory manual including even the production of standardized grouping and typing sera. Many equivocal statements are made. The laboratory techniques indicated are not always the best available but the newer techniques using enzyme treated cells for the detection of incomplete antibodies are included. The presentation of the Coombs test is confusing. The author here and in his discussion of anaphylactic reaction to transfusion claims the development of an antibody produced in the human serum by the parenteral administration of human serum protein. If there is need for a book of this sort this edition is not the answer because of the numerous errors which only the experienced will detect.

—L. C. L. A. S. Benson, M.C. L. S. A.

# Proper Use of the Outpatient Clinic

Warner F. Bowers Colonel, MC U S A. (1)

**I**N THE Army it has been traditional to regard outpatient and dispensary work as distasteful and fit only for junior officers who have no recourse. This attitude has been fostered to the point where many hospitals have outpatient clinics as a separate service with a full-time assigned staff or with residents assigned for 6-month rotations. As things now stand when senior residents finish their training in surgery they expect to be occupied full time with gastrectomies and pneumonectomies and feel greatly injured at the prospect of any assignment where it may be necessary to see dispensary patients. This attitude is unwholesome unrealistic, and leads to personal dissatisfaction. It should be realized that private practice, at least in a physician's first few years, is made up largely of the type of patients we call outpatient or dispensary cases and the young physician is delighted to see them fill his waiting room. It must be realized also that outpatients are quite a diagnostic challenge because they present themselves without a handful of laboratory and x-ray reports. The physician who sees only inpatients loses the chance to make early diagnoses and loses his sense of discrimination as to what tests and examinations are pertinent. This has led to the abominable "routine workup" concept where every patient gets a blood calcium determination, a BMR, a multiple lead ECG et cetera on the off chance that these tests may show something. He is also likely to get a large injection of several antibiotics to tide him over while the various reports are being typed and filed. If the reports are negative and the patient is still not well after the antibiotic administration the doctor will then consider the possibility that a physical examination may be needed. If this sounds like an exaggeration I can vouch for the fact that such a procedure has been encountered many many times in recent months. A return to fundamentals is a crying need and what is more fundamental than that the physician should see and work up his own patients? With the present system many patients complain of the cold

(1) Surgical Consultants Division, Office of the Surgeon General, U. S. Army



impersonal attitude and institutionalized atmosphere of our system when they see Dr. A in the outpatient clinic for a workup, are admitted to the hospital, and operated on by Dr. B and return to the outpatient clinic for followup by Dr. C.

Probably the best way to put across the concept of the proper use of the outpatient clinic is to give a concrete example of how it could be handled. It is granted that probably one full-time physician (who can see patients in some special field of his own interest to keep up his professional attainments) is needed in the outpatient clinic as a general coordinator. Under him, the chief of the surgical service from the hospital is responsible for the staffing and running of all the special surgical clinics. The chief of the surgical service then places each section chief in charge of his special clinic and the section chief assigns each of his ward officers and interns to a specific period each week when he is responsible for the outpatient work. In figuring the running guide for surgical service it is assumed that there will be chief of service, a assistant chief of service and an anesthesiologist on medical officer for each ward who in addition to his ward duties can spend one-half day a week in the outpatient clinic. The chief of service should give general supervision to make full use of teaching material, but should also have one specific period each week in the outpatient clinic to see his own new and follow-up patients. As an example Captain D of Ward 8 is responsible for Tuesday afternoon in the surgical outpatient clinic each week and there he sees Private E who has a hernia. When Private E is admitted to the hospital, he is known to the admitting officer to be Captain D's patient and is admitted to Captain D's ward. Because they are already known to each other Private E does not have a feeling of being in a completely new environment surrounded by strangers. Captain D then arrange for Private E's operation performing it himself or being assisted to or assisted by more experienced man as circumstances require. When Private E is ready to leave the hospital Captain D arranges with the social service worker for Private E to come to the Tuesday afternoon outpatient clinic at suitable intervals where he again is seen and followed by Captain D. All members of the service in this way develop an interest in patients as people rather than cases and the patients see medical officers as friendly advisors rather than as unknown figures clad in white coats and emitting big words. The medical and neuropsychiatric services are organized in the same way.

This system is simply not different from what is done in civilian—especially university—practice and insures an improved doctor-patient relationship together with a more healthy and realistic outlook on the part of the physician. The fact that this system is not in use now does not mean either that it is not good nor that it will not work. It simply means that it is easier to resign a physician to 6 months in the outpatient clinic and let him sweat it out than it is to follow a system which will give more proper status to outpatient care.

# Roentgenographic Technics in Dentistry

Francis P. Cassidy *Captain, D.C., U. S. A.*

**R**ADIOGRAPHY has become an integral part of the dental diagnostic workup. It is the only sure means by which (1) pathologic changes of hard tissues such as caries abscesses cysts granulomas osteomyelitis, bone tumors periodontal lesions and fractures (2) overhanging fillings (3) abnormalities in root form, (4) retained and impacted teeth, and (5) many other conditions may be detected and accurately located. A dentist does not produce radiographs of high quality simply by owning fine equipment and pushing a button. On the other hand he need not take intensive courses in radiographic technic and interpretation. The greatest plea of the leading radiologists is that dentists develop a standardized technic (1) and be able to read and interpret their films intelligently. This requires a familiarity with the anatomic structures involved variations within the normal and variations which are pathologic.

For a number of years after the discovery of x-rays the profession as a whole failed to adopt a consistent means of producing radiographs. The first radiographic method to be standardized was the bisecting angle technic with an 8-inch focal spot film distance. The placement of the film is governed by the anatomic variations of the area of the mouth being examined. Part of the film touches the incisal edges or lingual cusps of the teeth, and the rest of the film is inclined to form an angle with the long axes of the teeth, the degree of inclination depending on the structural limitations. To obtain an image having the same length as the teeth, the central beam of the x-ray is directed through the apexes of the teeth and perpendicular to the bisector of the angle formed by the mean planes of the film and the teeth (2). Rays directed perpendicular to the plane of the teeth produce elongation. Those directed perpendicular to the plane of the film produce foreshortening.

(1) Ellis, L. M.: *Dental Radiology* 3d edition. Lea & Febiger, Philadelphia, Pa. 1939 p. 16

(2) W. H. L. (editor): *American Textbook of Operative Dentistry* 7th edition. Lea & Febiger, Philadelphia, Pa. 1940. p. 40

Maxillary molars present the greatest difficulty for two reasons. The first handicap is the physical make-up involved. The height of the vault and length of the alveolus greatly influence the inclination of the film. A high vault and long alveolus are most nearly ideal because this situation provides for more nearly parallel film placement. The zygomatic process is almost always included in this roentgenogram, superimposed on or above the images of the teeth (fig. 1B). Second there is the problem of the separation and divergence of the buccal and palatal

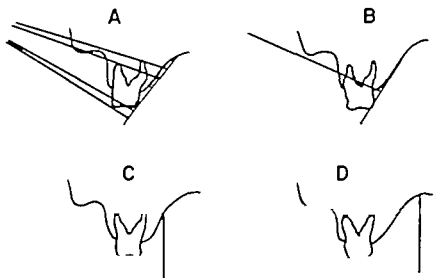


Figure 1

roots. Thus when the rays are directed perpendicular to the buccal plane the images of the palatal root and lingual cusps will be higher than those of the buccal roots and buccal cusps (fig. 1A). Directing the rays from higher up gives a truer image of the palatal roots but foreshortens the buccal roots while a more horizontal approach accurately reproduces the buccal root but lengthens the palatal roots.

If the teeth were merely two dimensional entities there would be no difficulty because we would not be dealing with mean planes. The anterior teeth more closely fit this classification in that they have but one root. The films which exhibit the most exact reproduction of the true size and shape of the teeth are those involving the lower molars. This accuracy is possible because of the vertical surface of the lingual portion of the alveolus, the region allowing film placement which is parallel with the axis of the teeth. If the film is placed too close to the upper molar in making the parallel film placement the apexes of the roots will not show (fig. 1C). By moving the film back to the midline of the palate the apex may be included and the image of the zygoma

will be shown above the tooth (fig. 1D) rather than on it as in figure 1B. It has long been recognized that bite-wings furnish the most reliable picture of caries again because of the nearly parallel film positioning. Such images are free of distortion of parts which results when exposures are made at an angle.

A few of the early investigators reasoned that parallelism of all intraoral films would facilitate the interpretation of roentgenograms because in effect each film would be a periapical bite-wing (3). McCormack (4) produced excellent radiographs but his method proved to be impractical for the average dental office. His positioning of the patient was not possible with standard dental equipment and 1 hour was required for a complete set of intra- and extraoral pictures. Furthermore he used focal-spot film distances of up to 40 inches thus becoming one of the first dentists to support the contention long held by medical radiologists that increased cone lengths produce much less diffusion of detail. In recent years these conceptions of parallelism and long-tube technics have been formulated by Fitzgerald (5) into a practical and standard procedure. He has described an efficient method for placing films in the mouth in a plane parallel to that of the teeth. His experiments with various cone lengths have proved conclusively the advantages in image sharpness to be derived from an increased focal spot film distance.

An understanding of the physics involved is necessary in conveying the principles of the long-tube technic. Ideal radiographs could be produced if the x-ray beams were parallel giving shadow images of the same dimensions as the object. This would hold regardless of the focal spot film and object film distances. In reality however the beams are divergent resulting in adumbration and magnification on the film. Of these two unfavorable qualities adumbration or aberration of detail is the more serious in most instances. Undistorted magnification would not be a bad quality but such enlargement is not the case where three dimensional objects are concerned. Those parts farthest from the film are more greatly magnified than those in closer proximity and an untrue image is formed (fig. 2). The most striking example of this is the enlargement of the zygoma in a maxillary molar picture.

Adumbration is a consequence of x-radiation emanating from a plane rather than a point (fig. 3A). The result is a crisscrossing of rays through the structures causing a lack of detail on the film (6). Three

(3) Wiegner, D. T.: Principles of extension cone technique. J. Missouri State Dent. Convention 30-704, Jan. 1930.

(4) McCormack, F. W.: Plea for standardized technique for oral radiography. J. Dent. R. 2:467 Sept. 1920.

(5) Fitzgerald, G.: Dental roentgenology II: Vertical angulation, film placement and screen object-film distance. J. A. D. A. 34:160, Feb. 1947.

(6) Fitzgerald, G.: Dental roentgenology I: Investigation in adumbration or effect of the conical geometry on sharpness. J. A. D. A. 34:1 Jan. 1947.

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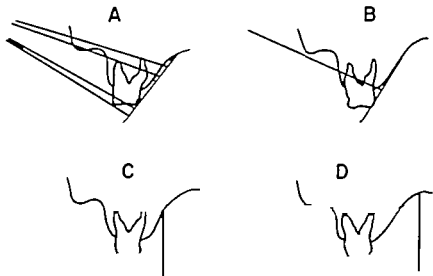


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(3) W. J. Gieseler, D. T.: Principles of extension cone technique. J. Missouri State Dent. Convention 30-204, Jan. 1950.

(4) McCormack, E. F. W.: Plea for standardized technique for oral radiography. J. Dent. Res. 2:467 Sept. 1920.

(5) Fitzgerald, G.: Dental roentgenology II. Vertical angulation, film placement and accurate object-film distance. J. A. D. A. 34:160 Feb. 1947.

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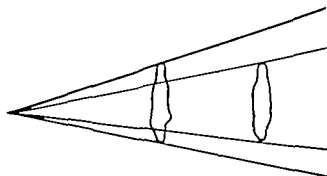


Figure 2.

variables are involved in the control of adumbration and magnification (1) the object-film distance (2) the focal spot-film distance and (3) the effective focal spot size. The more closely the film is placed to the part being radiographed, the more distinct and less distorted the roentgenogram will be (fig. 3B). Absolute contact would afford more nearly perfect image but anatomical make-up imposes limitations on the approximation of film and teeth (7).

Because adumbration is the result of crisscross beams it follows that by decreasing the effective focal spot size the adumbral effect will be lessened (fig. 3C). Although it is impossible satisfactorily to compensate in this manner alone because there is a limit to how small the effective focal spot size may be, modern x-ray units are being made with the smallest effective focal spots in order to take advantage of every corrective possibility. Increasing the focal spot-film distance (fig. 3D) is the most practical means of minimizing the effect of divergence of the rays and this is one of the basic tenets of the "Gerald" technique. As the source of radiation is withdrawn from an object rays passing through the object tend to become more parallel and the focal spot becomes more pointlike in effect. The more nearly parallel the rays become the closer the roentgenogram approaches the ideal. Practicality limits the extent to which the cone length may be increased.

In order properly to position films in the mouth on a plane parallel to that of the teeth, it is often necessary to place the film at some distance from the teeth, especially when x-ray the maxillary teeth. Such a procedure would seem to be contraindicated in the light of the content on the enlargement and diffusion increased as the film is placed further from the teeth, but the effect is less lost by an in-

creased object-film distance is more than offset by the greater cone length. If short-cone techniques are used the leeway in object film distances is very small but as the cone length increases this tolerance becomes greater (cf figs 3A and 3D)

Fitzgerald conducted a series of experiments with various focal spot film distances film-object distances and focal spot sizes and concluded that there is a much greater degree of latitude in film place-

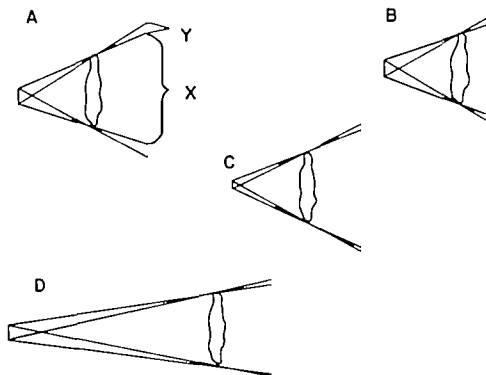


Figure 3 X is the sharp or interior portion of the image and Y is the penumbra or blurred portion.

ment with a 20-inch cone as compared to an 8-inch cone. Using the shorter cone diffusion of detail and magnification are much more apparent as the film is moved away from the tooth. The most noticeable changes occur in images of the osseous tissues and structures like the periodontal spaces apices of teeth and root canals (6). When larger focal spot sizes were used the changes were even more striking. This work illustrates conclusively that greater cone lengths and smaller focal spots more than compensate for the increased object-film distances required of the parallel film technic.

When using a parallel film positioning the film-object distances vary markedly according to the region involved. The first step in this procedure is a clinical examination of the oral structures and the inclination of the teeth. The film packet should be placed in the mouth



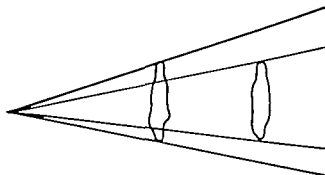


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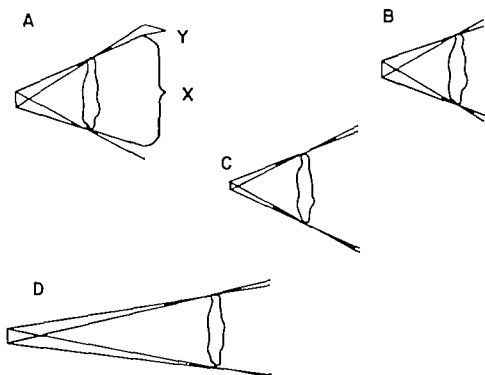


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so that its plane is parallel to the long axes of the teeth to be x-rayed. Lower molar films may be placed close to the teeth but in all other areas the film must be well away from the teeth. Such positioning places the packet in the most spacious regions of the mouth thus allowing efficient and absolute parallelism of the two planes (5). A metal backing for the films is used to insure a flat nonyielding packet. This eliminates the dangers of distortion resulting from bent films.

There are two methods of maintaining the films in the correct plane in the mouth. They may be most efficiently held in position by use of a hemostat with a rubber bite block. This device permits placement in any position of the mouth. When the film has been properly aligned the patient is instructed to bite down on the rubber block and this holds the film securely in place. The film packet lies at a right angle to the plane of the handles of the hemostat; therefore the x-ray cone may be directed parallel to this plane when exposure is made. Such an arrangement eliminates the necessity of peering into the mouth to line up cone and film.

Cotton 11 may also be used as a means of securing the films in position, but this method does not allow the wide range of placement available with benostat. When patient prevents wide low arch it is also impossible adequately to maintain the film at the proper interval with cotton rolls. For the kind of standardization the use of benostat is preferred.

Decide the exposure time varies in direct proportion to the square of the spot-film distance. It would seem that the correct exposure time for a 20-inch cone length would be prohibitively long. In theory this is true but compensatory measures may be employed. The one is to divert to concentrate the primary beams and eliminate secondary radiation and the time factor is further decreased by the use of a fast emulsion film. The result is an exposure only slightly longer than average.

Most dentists now agree that radiographs produced by the 1/2 inch tube technique are vastly superior to others but some contend that the method described by Fitzgerald for the office of the general practitioner with the 20-inch tube is too bulky and that the associated 26 exposures are too much time. In order to make available to all dentists the advantages of a long tube technique several investigators have proposed modification of Fitzgerald's concepts.

Till  $\sim (k)$  has outlined an approach which may conveniently be employed by my busy dentist in place of the 20-nch cone and 2' exposures to 14-nch cone and the standard number of film exposures in cone length 1 ft. It decreases the definition of detail.

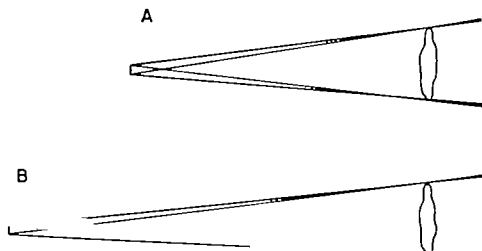


Figure 4. Diagram showing the almost negligible decrease in adumbration with increased focal spot film distance beyond a certain point.

and the tolerance in object film distance but this sacrifice seems justifiable for the sake of adaptability and practicality

Studies have shown that adumbration and magnification are greatly reduced as the cone length is increased from 8 to 14 inches and that beyond 14 inches this reduction tapers off as the distance is further increased (fig 4). Films exposed at the 20-inch tube length do not exhibit the ultimate in radiographic perfection all other factors notwithstanding the ideal is approached as the focal spot film distance is increased toward infinity Fitzgerald arrived at the 20-inch figure as the one most suiting his needs. It has been adopted by several schools for teaching purposes. Dentists desirous of using an extended cone technic should work out for themselves the method which they may follow with the greatest efficiency

#### SUMMARY

In radiographs made according to the bisecting angle technic (1) the structural images are often distorted in size and shape (2) lack of detail and sharpness is the rule rather than the exception (3) the tolerance in object-film distance is very limited and (4) superimposition of adjacent structures often masks the images of the areas being examined especially in the upper molar region

A technic of parallelism and increased cone length does not completely eliminate these shortcomings but it does alleviate them to a

large degree. Parallel film placement affords undistorted image and greatly lessens the amount of superimposition. Advantages are controlled by focal spot-film distance, object-film distance and focal spot size. The focal spot-film distance should be the longest practicable for the individual dentist. The object-film distance should be within the range of effectiveness and sharpness determined by the cone distance. The focal spot should be the smallest size available.

## BOOK REVIEW

*The Growth, Replacement and Types of Hair*, by J. B. Hamilton and A. E. Light (Conference Chairmen), P. Alexander, B. L. Baker, R. S. Bear, G. W. Bristle, R. J. Block, E. G. Butler, O. H. Duggins, F. Ellinger, V. C. Fox, S. W. Gern, A. Groud, W. H. Hardy, L. P. Herrington, C. H. Layman, C. P. Leblond, A. A. Liebow, R. J. Myers, C. R. Nebbeck, J. P. Powell, E. L. Reynolds, H. J. Rogers, W. F. Storry, L. W. Thigpen, W. Trotter and S. B. Wolfe. Consulting Editor, J. B. Hamilton. Editor, Roy Wald. Editor, A. G. Light. Editor, B. J. Heneghan. Annual of the New York Academy of Science, Volume 53, Part 3, pages 461-752. 288 pages. Illustrated. New York Academy of Science, New York, N. Y., published March 27, 1951. Price \$4.

This volume in magazine form includes 27 articles by various authors and is the result of a conference on the growth, replacement and types of hair held by the Section of Biology of the New York Academy of Sciences in February 1950. The conference was organized with the idea of assembling known facts on many phases of hair growth and development with special emphasis on new and hitherto unpublished research work. The articles represent a comprehensive survey of hair in mammals covering the subject from embryology and histology through, and including the effect of ionizing radiation. Certain aspects such as pigmentation, bacteriologic effects and the metric of hair among were omitted in order to keep the conference within reasonable limits. The subject matter is otherwise excellently covered and this volume is an excellent reference work. There is, of course, naturally not included in any of the papers.

—Capt. L. A. McClatchy, MC, U. S. A.

# Lymphogenous Cysts of the Mediastinum

## Cystic Hygromas, Pericardial Cysts, and Pericardial Diverticula (1)

Robert B. Brown *Captain, MC, U. S. N.*

Robert G. Dunn *Lieutenant, MC, U. S. N.*

**T**HIS study was stimulated by a desire to classify properly an asymptomatic thin-walled, cystic tumor removed at operation from the mediastinum of a young white man. These simple cystic tumors located as a rule in the anterior mediastinum, have been designated as mediastinal cystic hygromas or lymphangiomas pericardial cysts or, if communicating with the pericardial sac as diverticula of the pericardium.

### MEDIASTINAL CYSTIC HYGROMAS OR LYMPHANGIOMAS

In 1904 Seidel (2) reported a cystic tumor of the mediastinum found at autopsy in a 2-year-old child. This lesion involved the thymus and is cited by Ewing (2) as a mediastinal lymphangioma. Lenkeit (3) and Eliaschewitsch (4) also found intrathoracic lymphangiomatous tumors at autopsy. Lenkeit described one of the epicardium and Eliaschewitsch, one of the pericardium. Both were located entirely within the pericardial sac.

Michaelis (5) discussed intrathoracic lymphangiomas and referred to them as the rarest of mediastinal cysts. He reported an 8-month-old child on whom operation was unsuccessful. At postmortem examination a cervical component of the lymphangioma was demonstrated. This must be considered a combined cervicomediastinal hygroma.

(1) U. S. Naval Hospital Philadelphia, Pa.

(2) Seidel, L. D. *Inaug. Dissert.*, Leipzig, 1904. Cited by Ewing, J., *Neoplastic Diseases*, 4th edition, W. B. Saunders Co., Philadelphia, Pa., 1940, p. 1001.

(3) Lenkeit, W.: *Systeme der Epithel- und Perikardialcysten*, *Centralbl. f. allg. Path. u. path. Anat.* 44: 97-100, Dec. 10, 1928.

(4) Eliaschewitsch, P. A.: *Über die Perikardialcyste*, *Virchows Arch. f. path. Anat.* 270: 868-872, 1929.

(5) Michaelis, O. (Berlin): *Die intrathorakalen cystischen Lymphangiome*, *Deutsche Zeitsch. f. Chir.* 242: 250-256, 1934.

The first mediastinal lymphangioma successfully operated on was reported by Skinner and Hobbs (6). The patient was a 7-year-old child who complained of tightness in the chest, orthopnea and nonproductive cough. After study a mediastinal cyst was suspected. A large multiloculated cyst adherent to the right diaphragm, inferior vena cava, pericardium, and thymus was treated by evacuation excision or destruction of successive loculations by a two-stage operation. Convalescence was complicated by empyema but recovery was complete. Microscopic study of the excised specimen showed hyaline fibrous tissue with scattered areas of fat cells, foci of lymphocytes, blood vessels, occasional smooth muscle fibers and large and small cystic areas lined with single layer of flattened endothelium.

Scout (7), Heuer and Andrus (8) and Lambert (9) discussed mediastinal lymphangiomas but contributed no cases of their own. Lambert's interest in these cystic tumor was centered on their differentiation from pericardial cysts. He stated that in many respects these two lesions are similar. Both are probably congenital in origin. Both have wall composed of loose fibrous tissue and are lined by a layer of flattened cells. Although the cells are probably mesothelial in hygroscopic and endothelial in pericardial cysts, it is impossible to distinguish the two histologically. Lambert continued by saying that lymphangiomas are multilocular and are composed of a conglomerate mass of individual cavities which vary greatly in size. In addition they are intimately incorporated with the various structures and which they are situated. There is no sharp line of cleavage they cannot be shelled out and they receive their blood supply from all sides.

Sanders et al. (10) reported the operative removal of a grapefruit-sized cystic lymphangioma from the right upper portion of the mediastinum of a 59-year-old man. The lesion was well encapsulated and was mobilized and removed from its position between the trachea and esophagus with but moderate bleeding. The microscopic findings were essentially those described by Skinner and Hobbs (6) and Lambert (9). Watson and Diamond (11) found 1 cystic hygroma among 13 surgically explored mediastinal tumors in Navy personnel. Details of this case are not available except as obtained by Groff and Hurant (12) through personal communication with Watson. It is stated

(6) Skinner, G. F. and Hobbs, M. E.: Intrathoracic cystic lymphangioma. *J. Thoracic Surg.* 6, 99-107, Oct. 1936.

(7) Scout, A. P.: In discussion of article by Foss, J. C.: Tumors of mediastinum. *New York State J. Med.* 37: 997-1004, May 15, 1939.

(8) Heuer, G. J. and Andrus, W. DeW.: Surgery of mediastinal tumors. *Am. J. Surg.* 30: 145-146, Oct. 1940.

(9) Lambert, A. V.: Etiology of thin-walled thoracic cysts. *J. Thoracic Surg.* 10: 17, Oct. 1940.

(10) Sanders, S., Harbison, J. E., and Schuch, G. K.: Cystic lymphangioma of mediastinum. *J. Thoracic Surg.* 14, 253-258, June 1945.

(11) Watson, W. L. and Diamond, H. D.: Surgical thoracic tumors in Navy personnel. *J. Thoracic Surg.* 16, 111, Feb. 1947.

(12) Groff, R. E. and Hurant, W. F.: Communication of mediastinal cysts.

that the tumor involved the trachea and superior vena cava in a 24 year-old man. The cyst was successfully resected.

Gross and Hurwitz (12) reported a mediastinal cystic hygroma in a 32-year old man. The lesion was asymptomatic and was diagnosed as a mediastinal tumor or cyst by means of roentgenograms. At operation a multilocular cyst, the size of two fists was removed from the anterior mediastinum on the right where it was lightly adherent to the pericardium. The fluid content was clear and amber colored. Microscopic examination showed a typical hygroma, the walls of which were formed by loose connective tissue, the spaces being lined by an endothelium. The most recent report of a mediastinal cystic hygroma is that of Curreri and Gale (13). The lesion was found at operation in a 4-year-old child. Data on the treatment and result are not available.

To summarize the information gathered from these reports on mediastinal cystic hygromas it may be stated that they are regarded by most as congenital lesions. Their exact origin has not been established. Eigler (14) and Michaelis (5) suggested that they grow down from the neck. Skinner and Hobbs (6) hypothesized that a portion of the anlage for vessel formation could be drawn down from the region of the gill cleft by the pericardium in its descent. Cystic hygromas are usually multilocular. The fluid content is most often thin and colorless. These cysts tend to become adherent to and grow between and around contiguous structures without any sharp line of cleavage. The cyst wall is fibrous and may contain scattered smooth muscle fibers, foci of lymphocytes, nerve fibers, and clusters of fat cells. These latter elements may be neighboring tissue incorporated in the cyst wall by its growth rather than an integral component of the wall itself. The cyst lining is composed of a single layer of flattened cells, probably mesothelium.

Table 1 summarizes the 7 published cases which on the basis of the above criteria we believe may be classified as mediastinal hygromas. Excluded are cervicomediastinal and intrapericardial lesions. This group is too small for a statistical study.

#### PERICARDIAL CYSTS

In 1929 Dufour and Mourut (16) found at autopsy a "lymphatic cyst" in the anterior mediastinum of a woman, aged 86 years, who had died of cerebral softening. This cyst was in juxtaposition to the pericardium, was lined by flat endothelial cells and contained about 120 cc of

(13) Curreri A. R. and Gale J. W.: Mediastinal tumors. Arch. Surg. 58: 797-818 June 1949.

(14) Eigler W.: Über endothorakale Zysten. Deutsche Zeitschr. f. Chir. 199: 133-141 1926.

(16) Dufour H. and Mourut: Kyste de la partie supérieure du péricarde chez une femme de quatre-vingt-six ans. Bull. et. mem. Soc. med. d. hôp. de Paris 53: 1482, Dec. 30 1929.



TABLE 2. Mediastinal lymphoma

Year	Number of patients	Number of patients (year)	Sex	Symptom	Lesion	Treatment
1941	1	1	2	—	Involved thymus	None; followed at age 17
1942	1	1	M	Tightness in chest, orthopnea, cough	Rightward displacement of pericardium, aortic valve, and pericardium	None; followed at age 17
1943	1	1	M	—	Involved thymus and pericardium	None; followed at age 17
1945	1	1	M	Asymptomatic	Rightward displacement of trachea and esophagus	None; followed at age 17
1946	1	1	M	—	Involved thymus and superior vena cava	None; followed at age 17
1948	1	1	M	Asymptomatic	Rightward displacement of pericardium	None; followed at age 17
1949	1	1	M	—	—	—

From: 1. Li Cynd. Lymphomas of mediastinum. *Arch. Intern. Med.* 54:116-118, 1939. Cited by Gross and others (12).

orange-colored fluid. On the basis of this report these authors have been credited with describing the first pericardial cyst. Hart (17), however, in 1837 referred to a case mentioned by Boyer in his *Traité de Maladies Chirurgicales* which he (Hart) believed may have been a pericardial cyst. Atayaz Maraty (18) also found at a postmortem examination a pear-shaped "diverticulum" in the anterior mediastinum. This was connected to the pericardium but did not communicate with the pericardial sac so that it was in truth a cyst. The structure of the wall was comparable to that of the pericardium and the cyst contained 80 cc. of yellow fluid.

Yater (19) described a cyst of the pericardium found at autopsy in a white man aged 52 years who had died with gastric carcinoma. The cyst was intimately associated with the parietal pericardium on the left and was situated just above the diaphragm. It was thin-walled, multilocular and contained clear yellow fluid. The author diagnosed this a "cyst of the pericardium" and suggested that it was probably derived from a lymphatic vessel of the parietal pericardium. We have included this case with the pericardial cysts but it may have been a mediastinal lymphangioma. Lack of histologic data on the cyst wall makes sharper classification difficult.

The case of pleuro-diaphragmatic cyst reported by Pickhardt (20) was unique from two points of view. It was the first of these cysts successfully operated on and was symptomatic. The patient was a woman 53 years old who complained of a sharp knifelike pain over the precordium. The tumor mass was demonstrated by roentgenograms and thoracoscopy. At operation a thin-walled cyst was found in the left costophrenic angle at the junction of the diaphragm, apex of the pericardium, and the thoracic cage. It was about the size of an orange and was easily shelled out with little bleeding. A smaller cyst, 1.5 cm. in diameter, adjoined but did not communicate with the larger cyst. The inner walls of the cysts were of acellular fibrous tissue which was dense and laminated. The outer layer was not so dense and was rich in cells resembling lymphocytes. The blood vessels were few. The inner surface was covered with deeply staining cells of an endothelial type. The patient was relieved of precordial pain following operation.

Rizzi (21) found a cyst of the pericardium at postmortem examination of a man 53 years of age who had died an accidental death. The cyst projected from the anterior aspect of the pericardium to the right, measured 3 by 10 cm. and was smooth and shiny in appearance. Its wall was similar to the fibrous layer of the pericardium. No endothelial

(17) Hart, T.: An account of hernia pericardii. Dublin J. M. Sc. 11: 365 1837.

(18) Atayaz-Maraty, M.: *Spitalul* 15: 33 1895. Cited by Cushing (46).

(19) Yater, W. M.: Cyst of pericardium. *Am. Heart J.* 6: 710-712 June 1931.

(20) Pickhardt, O. C.: Pleuro-diaphragmatic cyst. *Ann. Surg.* 99: 814, 1934.

(21) Rizzi, L.: Cisti e diverticoli del pericardio. (*Studio critico contributo anatomico-patologico.*) *Cuore e circolaz.* 19: 559-570 Sept. 1935.

lining was demonstrable Bartolozzi (22) found a cyst arising from the right side of the pericardium in woman 80 years old who died of myocarditis. It was the size of a man's fist and contained limpid yellow fluid. No description of the cyst wall was given.

Churchill (23) described a cyst found at operation as a simple hydrocele of the mediastinum. It was located anteriorly and to the right, but no specific mention was made of its situation in relation to the pericardium. The pathologist described the cyst as thin-walled and assumed the lining to be mesothelial, saying: These mesothelial cells are ordinarily so thin that they can hardly be distinguished from endothelium but they occasionally thicken up to a cuboidal type of cell that looks quite like epithelium.

Went (24) reported a fist-sized globular roentgenographic shadow adjacent to the right border of the heart in man 36 years old who had heart disease. The mass transmitted cardiac pulsations. At operation an apple-sized, smooth-walled cyst was easily removed. The wall was composed of firm fibrous tissue and no epithelial lining could be found. This was assumed to be a pericardial cyst.

Lambert (9) reported 3 cases which were strikingly similar in many respects. The cysts were unilocular and were on the left, lying in direct contact with the anterior chest wall, pericardium, and adjacent lungs. They shelled out readily at operation. The blood supply came either from the pericardium or the diaphragm. The cysts were lined by a membrane composed of flattened cells loosely applied and resembling swollen vascular endothelium. These cells rested on a very loose-textured vascular fibrous tissue and a moderate amount of fat tissue. A few smooth muscle cells were seen. These cysts appeared to be lined with endothelium but differentiation from mesothelium was not possible. Lambert believed that the cysts did not fit into the lymphangiomatous group. He suggested that it was not only possible but probable that they were formed by abnormalities in development of the pericardial lumen.

Greenfield et al. (25) reported a "spring water" cyst of the mediastinum. They stated Churchill was first to use this description. The patient was a woman 44 years old who complained of a sudden severe constricting pain across the anterior portion of the chest. A diagnosis of cyst of the mediastinum was made following fluoroscopy teleroentgenography and angiocardigraphy. At operation a tense globular cystic mass was found in the anterior portion of the mediastinum. It covered the upper half of the pericardium and was grapefruit-sized. It

(22) Bartolozzi, M. *Per malformazioni del sacco pericardico*. *Riv. esp.* 26: 355, 1936.

(23) Cohen case No. 23472—Simple cyst of mediastinum. *New England J. Med.* 217: 954, 1937.

(24) Went, F. H. *Seltene benignes Thoraxtumoren*. *Fluorographia* 11: 85-92, Feb. 1939.

(25) Greenfield, L., Steinberg, L., and Towell, A. S. W. "Spring water" cyst of mediastinum, case report. *J. Thoracic Surg.* 12: 495-502, June 1943.

was densely adherent superiorly but its origin could not be demonstrated. The content was crystal clear fluid. The cyst wall was tissue paper thin with a smooth inner surface. The pathologic diagnosis was mediastinal cyst lined by columnar epithelium. The authors believed that their cyst was neither a lymphangioma nor a pericardial celomic cyst but was quite similar to the cyst previously described by Churchill (23).

Blades (26) found 10 pericardial cysts included in a group of 94 benign mediastinal tumors treated surgically in the Army thoracic centers. All were asymptomatic. All were discovered by routine chest roentgenograms and were described by the author as thin-walled structures usually in contact with the anterior chest wall and parietal pericardium. They were occasionally large enough to impinge on the lung or diaphragm. The walls of the cysts were made up of fibrous connective tissue lined by a layer of flattened endothelial or mesothelial cells. Blades stated that an anomalous development of the pericardium probably explains their formation and that in the past certain of these cysts were classified as cystic hygromas or lymphangiomas. He recommended operation as the only means of establishing the nature of the lesion. Bradford et al. (27) reported 8 cases of pericardial celomic cysts. Because their source of material included that of Blades it is probable that many or all of their cases were described by Blades. In one of the cases reported by Bradford et al., the cyst was lined by ciliated epithelium, making it doubtful that it should be included in this group.

Lam (28) described pericardial celomic cysts and subscribed to Lambert's ideas on the subject. He reported the case of a white woman, aged 39 years, who had complained of fever, shortness of breath, fatigue, and angina pectoris for 10 years. Roentgenograms led to the diagnosis of a large tumor overlying the heart. At operation a huge thin-walled cyst was found in the mediastinum anterior to the heart and great vessels. It projected around behind the heart on the right. During removal the cyst ruptured with the escape of 1 000 cc. of clear straw-colored fluid. The pathologist reported a simple cyst without an epithelial lining. After operation the patient's pain disappeared but the fever persisted.

Guibal et al. (29) reported a woman 38 years old with an asymptomatic pleuropericardial cyst which was diagnosed roentgenographically and successfully removed at operation. The cyst was orange-sized, located on the right just above the diaphragm, and was in juxtaposition to the pericardium. It was thin-walled, lined with endothelium, and the

(26) Blades, B.: Mediastinal tumors; report of cases treated in Army Thoracic Surgery Centers in United States. *Ann. Surg.* 123: 749-765, May 1946.

(27) Bradford, M. L.; Mabou, H. W.; and Grow, J. B.: Mediastinal cysts and tumors. *Surg., Gynec. & Obst.* 85: 467-491, Oct. 1947.

(28) Lam, C. R.: Pericardial celomic cysts. *Radiology* 48: 239-243, Mar. 1947.

(29) Guibal, J., Ragnasen; and Carteaux: Kyste intra-thoracique pleuro-péricardique. *Extr. Soc. Méd. Acad. de chir.* 73: 350-353, May 14-21, 1947.



TABLE 2. *Pericardial cysts—Continued*

Author	Date	Number of patients	Age (years)	Sex	Symptoms	Location	Treatment
Bradford et al (27)	1947	8	31	M	Pain in epigastrium and left upper abdomen	To the left	Excision—successful
Lam (28)	1947	1	29	M	Asymptomatic	To the right	Excision—successful
			32	M	Asymptomatic	To the right	Excision—successful
			34	M	Asymptomatic	Anterior and to the right	Excision—successful
			39	F	Angina pectoris	Anterior and to the right	Excision—successful
Gallbl et al (29)	1947	1	38	F	Asymptomatic	To the right	Excision—successful
			Over 40	—	Asymptomatic	To the right	—
Curren and Gale (13)	1949	2	Over 40	—	Asymptomatic	To the right	—
			52	M	Asymptomatic	To the right	Excision—successful

No data on this case

Cur et al personal communication reported 2 more cases of symptomatic, right-sided pericardial cysts found in adult over 50 years of age

content was clear fluid. The authors stated that such lesions are probably congenital in origin and caused by faulty development of the celomic cavity in the zone of coalescence of pleura, pericardium, and peritoneum.

Currel and Gale (13) stated that these cysts usually occur on the left side and on fluoroscopy transmit the cardiac pulsations. They suggested pneumothorax to demonstrate the pericardial attachment. They reported 2 cases of pericardial cysts and recommended surgical exploration of all such unilateral mediastinal tumors. Schein (30) reported single case of cyst of the pericardium in a white man, aged 52 years, who was asymptomatic. The cyst was diagnosed roentgenographically and was successfully removed. It was attached to the right side of the pericardium by a pedicle. The cyst was thin-walled with the usual lining of mesothelial cells. These authors stressed the establishment of a diagnosis as the indication for operation. They mentioned that infection or malignant change in pericardial cyst has never been reported.

In summarizing the subject of pericardial cysts it would be difficult to improve on the gross and microscopic pathologic pictures presented by Lambert. His theory as to the congenital origin of these lesions is quite plausible. His desire to differentiate these pericardial celomic cysts from other thin-walled, clear fluid-containing cysts of the mediastinum is commendable even though it is not always possible. Table 2 summarizes the 37 reported cases of simple mediastinal cysts which we have classified as pericardial cysts, some with the reservations discussed above. In contrast to the group with cystic hygromas most patients with pericardial cysts were over 30 years of age and about half were women. In several symptoms were present which might be attributed to the cyst but in very few was this relationship confirmed by the disappearance of the complaints after operation. In no case was death attributed to the cyst.

#### PERICARDIAL DIVERTICULUS

Hart (17) was the first to report pericardial diverticulum. This he found during an autopsy of an aged woman with generalized anasarca. The diverticulum appeared as a pyriform sac in the anterior portion of the mediastinum. Fluid could be expressed from the sac into the pericardium proper through a finger-sized orifice at the point of reflection of the pericardium onto the aorta. The wall of the sac was similar to that of the pericardium. The pleural cavity was obliterated by old and extensive adhesions and the heart was hypertrophied, in a state of active aneurysm.

Bristowe (31) found a small lobulated flaccid bag in front of the pericardium of a woman, 47 years old, who had come to postmortem ex-

(30) Schein, C. J. Cyst of pericardium. *Am. J. Surg.* 78: 411-413 Sept. 1949.

(31) Bristowe, J. S.: Diverticulum from pericardium. *Tr. Path. Soc. London* 70: 101 1949.

amination. The diverticulum was the size of a pigeon's egg with an oval orifice into the pericardium which measured one-third of an inch in its long diameter. The wall of the diverticulum was identical with that of the pericardium.

Seidler (32) examined an elderly man who had died of apoplexy. Associated with a hypertrophied and dilated heart and a pericardial effusion was a circumscribed outpouching of the pericardium about the size of a hen's egg. The author visualized the diverticulum as a herniation of the pericardial wall at a weak spot which may have been congenital or inflammatory in nature and which gave way to an increased intrapericardial pressure from the cardiac enlargement and pericardial effusion.

Schirmer (33) found two pericardial diverticula at autopsy of a patient who had died of pulmonary tuberculosis. The heart was small, the walls of the diverticula were similar in structure to the pericardium and the author classified these lesions as congenital. Lauer (34) reported a single diverticulum of similar nature and again a congenital origin was suggested.

Grabowski (35) classified a diverticulum of the pericardium which he discovered at the postmortem examination of a woman 50 years of age as a pulsion diverticulum through a gummatous process in the pericardial wall. He divided pericardial diverticula based on their probable cause into pulsion, traction, and congenital types. He included those reported by Brastowe, Schirmer, and Lauer in the latter group.

Neprjachin (36), Ypsilanti (37), and Rizzi (21) each reported one case of a true or congenital pericardial diverticulum. In every instance the wall of the diverticulum was similar to that of the pericardium and no accompanying lesion was present to explain the diverticulum on a pulsion, traction, or inflammatory basis. All three authors accepted the possibility that true diverticula are developmental anomalies but pointed out that this hypothesis is difficult to establish because these lesions have never been found in embryos or the newborn.

In the literature from 1935 to date we have been unable to find any additional reports of a true or congenital diverticulum but dating back

(32) Seidler, E.: Ueber Perikarddivertikel. *Wi. u. klin. Wchschr.* 34: 592-594, Dec. 8, 1921.

(33) Schirmer, O.: Ueber Perikarddivertikel. *Centralbl. f. allg. Path. u. path. Anat.* 34: 61 1923-24.

(34) Lauer, W.: Zur Kasuistik der angeborenen Perikard-Divertikel. *Centralbl. f. allg. Path. u. path. Anat.* 36: 353 1925.

(35) Grabowski, W.: Zur Kasuistik der Perikarddivertikel. *Centralbl. f. allg. Path. u. path. Anat.* 37: 388 1926.

(36) Neprjachin, G. G.: Zur Frage über das perikardiale Divertikel. *Centralbl. f. allg. Path. u. path. Anat.* 39: 548, 1927.

(37) Ypsilanti, H. P.: Ueber einen Fall von echtem Perikarddivertikel. *Centralbl. f. allg. Path. u. path. Anat.* 50: 417-420 F. b. 20 1931.



the report of Krenböck and Weiss (38) voluminous literature on the roentgenologic diagnosis of pericardial diverticula has accumulated. This includes several case reports (39-45) and reviews (46-49). Of the 50 to 60 case reports collected by these authors many were unconfirmed roentgenologic diagnoses. Of the cases in which the diagnosis was confirmed by operation or autopsy few were true or congenital diverticula. New cases of congenital diverticula have not been reported in the earlier reports discussed above.

Pericardial diverticula have been separately classified on a etiologic and on structural basis. Many descriptive terms have been proposed among which are inflammatory diverticula, loculated exostoses, erosal hernias, traction diverticula, pulsion diverticula, true diverticula, and congenital diverticula. In a great many of the reported cases the diagnosis of pericardial diverticulum has been made only on the basis of an unconfirmed roentgenologic study.

TABLE 3. True or congenital pericardial diverticula

Author	Date	Number of patients	Age (years)	Sex	Location
Prinzen (31)	1908	1	4	F	Anterior
Schurmer (33)	1923	1	40	F	Posterior
Lacroix (34)	1925	1	30	M	T the right
Verrijckx (35)	1927	1	52	M	T the right
Verrijckx (37)	1931	1	34	M	T the right
Pacini (21)	1935	1	—	—	T the right

Ascertaining as true or congenital diverticula only those in whose wall the pericardial layer are represented and for which no other process or origin was demonstrated, 6 cases are summarized in Table 3. It is forced to admit that the congenital nature of these

(38) Krenböck, R., and Weiss, E.: Ueber die extraeitrliche Perikard-Devertikel. Fortschritte u. d. Geb. d. Pathogenese 40: 387-418, Sept. 1929.

(39) Freyhaas, E.: Inflammatory diverticula of pericardium (encapsulated pericardial effusion). Am. J. Pathology 57: 733-738, June 1957.

(40) Arizaga, P. C., Desorrea, C., and Tiquero, A. C.: Diverticulo del pericardio. Rev. argen. de cardiol. 3: 47-56, Mar-Apr. 1938.

(41) Passeron, G., and Veill, J.: Diverticule d pericarde. Bull. et mem. Soc. med. d. l'Univ. de Paris 54: 139-152, Jul. 19 1938.

(42) Valadier-Lacroix, G.: Etat actuel des données radiologiques dans le diagnostic différentiel des diverticules du péricarde. J. de radiol. et d'électrol. 25: 165-168, 1942-1943.

(43) Schurmer, O.: Zur Differentialdiagnose der Perikardverwülle und Cysten. Centr. blatt 8: 224, 1944.

(44) Verrijckx, J. P., and Glasco, M. L.: Diverticulo del pericardio. Rev. mex. mil. Paises Amos 44: 728-76, May 1945.

lesions has not been established. We are willing to accept the possibility suggested by Lambert that they are caused by inequality in the rate of development of one of the lacunae which later form the pericardial celom. In contrast to the cystic hygroma group all of these patients were over 30 years of age. Symptoms attributable to the diverticulum were not recorded for any of them. In all cases the diagnosis was made at postmortem examination, and in 4 death was caused by tuberculosis.

### CASE REPORT

A man 27 years old was admitted to the U S Naval Hospital, Philadelphia Pa. on 25 March 1949 for evaluation of a compensation claim relating to a head injury suffered while in the Army. His complaints were attacks of dizziness associated with loss of consciousness. Physical and laboratory findings were essentially normal. Roentgenograms of the chest showed an oval shadow about 2 inches wide at the lower right border of the cardiac silhouette. The mass was well visualized in the left oblique view and appeared to be located anteriorly adjacent to the right ventricle (fig. 1). On fluoroscopy there was a slight pulsation of the mass apparently a transmitted cardiac pulsation. The abnormal shadow seemed to change slightly in contour with respiration. The roentgenologist (R. D.) thought that the findings were suggestive of a pericardial cyst.

The patient was seen by a neuropsychiatric consultant who believed that it was unlikely that the dizziness and unconsciousness had an organic basis. No attack was observed while the patient was being studied. A surgical consultant (R. B.) was then asked to see the patient in regard to the asymptomatic intrathoracic lesion, and an exploratory thoracotomy was advised. This was performed on 22 April. Intratracheal nitrous oxide-ether anesthesia was used. The right hemithorax was entered through the bed of the resected seventh rib by a posterolateral approach. The cyst, which measured  $2\frac{1}{2}$  by  $3\frac{1}{2}$  inches presented from the anterolateral aspect of the pericardium and was readily exposed by retraction of the right middle and lower pulmonary lobes. It was thin-walled multiloculated and translucent (fig. 2A).

The mediastinal pleura was incised and separation of the cyst from the pericardium was accomplished with ease except over a central area where the attachment was intimate. Clear straw-colored fluid escaped, partially evacuating the cyst when its wall was incised by sharp dis-

(43) Aubert, M. and Kalafilleff, P.: Un cas de diverticul du Péricarde. *J. de radiol. et d'électrol.* 27: 553 1946.

(44) Cushing, E. H.: Diverticulum of pericardium. *Arch. Int. Med.* 59: 36-64, Jan. 1937.

(45) Reitan, H.: Beitrag zur Röntgendiagnose des Perikard-divertikel nach der abgrenzung Perikardexsudate. *Fortschr. a. d. Geb. d. Röntgenstrahlen* 58: 195-213 Sept. 1938.

(46) Eschbach, H.: Da chronisch-entzündliche Perikarddivertikel. *Deutsche med. Wchnschr.* 65: 840 May 1939.

(47) Foscati, F. and Cassali, C.: Diverticoli e cisti del pericardio; rassegna critica studio clinico-radiologica. *Arch. di pat. e clin. med.* 20: 383-433 F. b. 1940.



Figure 1. Preoperative views of the heart showing mass extending anteriorly and laterally from the lower right border of the cardiac silhouette (A) Frontal view (B) Oblique view

section in this region. Cystectomy was subsequently completed by excising the adherent pericardium along with the cyst. The small opening which had connected the pericardial sac with one of the loculations in the cyst could be seen (fig 2B). Convalescence was uneventful and the patient was discharged from the hospital on 5 May.

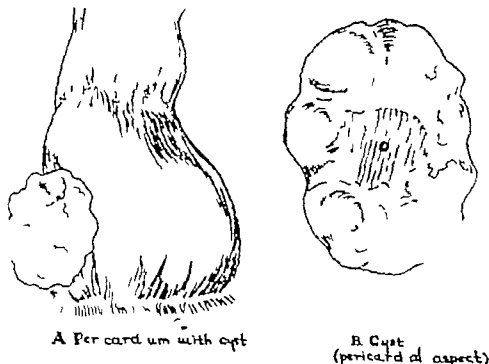


Figure 2. (A) A sketch to illustrate the general appearance, relative size, and relationship of the cyst to the pericardial sac. (B) The pericardial aspect of the cyst. The shaded area represents the piece of adherent pericardium excised. At its center is shown the small opening of communication between the pericardial sac and the cyst.

For the most part the microscopic sections showed no cyst wall lining. In areas where the lining was present the cells varied from flat to low cuboidal with dark staining nuclei (fig 3). These cells were of the endothelial type. The cyst wall varied in thickness and was composed of dense connective tissue which contained occasional adult fat cells, collections of lymphocytes and congested blood vessels. The outer surface of the wall showed a thin covering of fatty and loose connective tissue. The pathologist's diagnosis was serous cyst of the pericardium.

#### DISCUSSION

From a purely academic standpoint there is a great deal to be said for attempting a rigid classification of these simple cystic tumors of the mediastinum. Our own case adds to the impression gathered from



Figure 3. A photomicrograph of the cyst wall focused to show the cell lining the cyst wall.

review of the literature that this is not always possible even when all the clinical, roentgenologic and pathologic data are reviewed. A fair case can be made for placing the cystic tumor found by us in any one of the three classifications under discussion. The cyst was thin walled, multilocular and contained clear, straw-colored fluid. No sharp line of cleavage could be demonstrated over a sizeable area of its attachment to the pericardium. These features and the microscopic findings are compatible with diagnosis of mediastinal cystic hygroma.

On the other hand the intimate association of the cyst with the pericardium (and the pericardium alone) to the point of communication of one small loculation with the pericardial sac cannot be ignored. In this sense the commonest localization should be considered a pericardial diverticulum and the isolated loculations pericardial cysts. Perhaps it will be better not to try for descriptive terminology simply because of the multiloculated cystic tumor of the mediastinum communicating with the pericardial sac. The question might be raised whether this is the exception that proves the rule or whether this case

casts some doubt on the justification for separating mediastinal cystic hygromas and pericardial cysts on a structural or embryologic basis

From a clinical standpoint the distinction between these lesions is not essential. They cannot be differentiated on the basis of symptoms or roentgen examination. Even more important these benign lesions cannot be differentiated from malignant tumors and other masses of the mediastinum. The possibility of a malignant tumor constitutes the strongest argument for their surgical removal. In addition they may enlarge to produce distressing pressure symptoms (6, 20, 28) and in at least one instance infection in the mediastinal portion of a combined cervicomediastinal lymphangioma has resulted in death (50). At least 5 mediastinal hygromas and 20 pericardial cysts have been successfully resected.

(30) Singleton, A. O.: Congenital lymphatic diseases—lymphangiomas. *Ann. Surg.* 105: 952-968, Jan. 1937

## BOOK REVIEW

*Tobacco and the Cardiovascular System, The Effects of Smoking and of Nicotine on Normal Persons* by Grace M. Roth Ph. D. Associate Professor of Experimental Medicine Mayo Foundation for Medical Education and Research Graduate School University of Minnesota and Consultant in Section on Physiology Mayo Clinic Rochester Minn. Publication Number 100 American Lecture Series A Monograph in American Lectures in Circulation. Edited by Irvine H. Page M. D. Cleveland Clinic Cleveland, Ohio and A. C. Corcoran, M. D. Cleveland Clinic Cleveland, Ohio. 66 pages illustrated. Charles C Thomas Publisher Springfield, Ill. 1951 Price \$2.25

This brief well written monograph is by one of the foremost authorities on the physiologic effects of tobacco smoking. The subject is presented as a compendium based on research data of the author and others adequately documented and clearly stated. The subject is approached via a background of general aspects physiologic factors experimental methods and considerations then concluded by a series of questions answered by experimental data. The principal conclusion reached is that the smoking of tobacco is most likely a contributory factor and not a primarily etiologic one in the production of cardiovascular disease. Because of the many facets considered this is an excellent source book and one to be consulted before discussion of this somewhat controversial subject.

—Col. C. L. Leedbar, NC U S A

## BOOK REVIEW

The Quantitation of Mixtures of Hemoglobin Derivatives by Photoelectric Spectrophotometry by Francis T. Hunter, A. M., M. D., Assistant Medical Director, Harvard Medical School, Assistant Physician and Clinical Pathologist, Massachusetts General Hospital, Boston, Mass. 226 pages, illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1951. Price \$8.50.

This handbook is a study of the use of spectrophotometric measurements at carefully selected wave lengths for the quantitative determination of various blood pigments. The author emphasizes the importance of using narrow wave bands in the visible spectrum, requiring a minimum number of chemical procedures and employing colorless reagents in clear solutions.

Part I is a discussion of the general principle of spectrophotometry. The mathematical theory makes use of the Bouguer-Beer Law to show that the density of a mixture is a function of concentration which in turn is percent transmittance  $D = f(C) = 2.3T$ . The derivation of a general formula contains 2 and 3 mixture is given. Part II outlines spectrophotometric procedures for determining the various pigments including oxyhemoglobin, carbon monoxide hemoglobin, methemoglobin, bilirubin, et cetera together with a description of a device for diluting small amounts of blood under air-free conditions so that photometric determination of oxygen saturation is possible. The last portion of the book is composed of 4 appendices which include numerous calibration curves, nomograms and detailed absorption spectra in the visible region for various blood pigments and derivatives.

This is definitely a book for the specialist. The analytical procedures themselves are relatively simple but the theoretical treatment is not one which the average laboratory technician will understand. The book will be of more value to the research scientist whose main interest is in the field of blood pigment measurement than to the clinical laboratory technician.—Col. W. H. Bayl, MC, USA.

# Multiple Eosinophilic Granuloma of Bone With Pulmonary Involvement

Arnold J. Brody *Captain MC U S A (1)*

James O. Gillespie *Brigadier General, MC, U S A. (1)*

**E**OSINOPHILIC granuloma is a term that was first used by Lichtenstein and Jaffe (2) in 1940 to describe what was thought to be a localized condition of bone containing large numbers of eosinophilic granulocytes and giving rise to areas of cystic rarefaction. Earlier in the same year Otani and Ehrlich (3) had reported a similar lesion as a solitary granuloma of bone. Finzi (4) in 1939 probably reported the same disease when he described a myeloma with prevalence of eosinophilic cells in the frontal bone of a 15-year-old boy. Apparently eosinophilic granuloma of bone is also the same disease described in 1938 by Schairer (5) as osteomyelitis with eosinophilic reaction. Since Lichtenstein and Jaffe's description of eosinophilic granuloma as a new disease entity there has been an increasing number of cases now totaling over 90 reported.

## ETIOLOGY AND PATHOLOGY

The cause of eosinophilic granuloma is unknown. Trauma has been considered significant by some but proof of a causal relationship is lacking. Cultures and other bacterial studies have failed to reveal an infectious agent. Most authors now believe that eosinophilic granuloma is related to Letterer-Siwe and Hand-Schüller-Christian diseases in that all three are different expressions of the same basic disorder.

(1) Letterman Army Hospital, San Francisco, Calif.

(2) Lichtenstein, L. and Jaffe, H. L. Eosinophilic granuloma of bone with report of case. *Am. J. Path.* 16: 595-604, Sept. 1940.

(3) Otani, S., and Ehrlich, J. C. Solitary granuloma of bone. *Am. J. Path.* 16: 479-490, July 1940.

(4) Finzi, O. Mieloma con prevalenza delle cellule eosinofile circolanti. *Il Frontale* 1, n. 15, 1939. *Minerva Med.* (pt. 1) 9: 239-241, Feb. 17, 1939.

(5) Schairer, E. Ueber eine seltene Erkrankung des kindlichen Schädels (Osteomyelitis mit eosinophiler Reaktion). *Zentralbl. f. allg. Path. u. p. th. Anat.* 71: 113-117, Nov. 22, 1938.





ered as different clinical anatomic expressions of the same basic disorder but stated that the lesions in eosinophilic granuloma are given a distinct cytologic imprint by the abundance of eosinophils and usually do not tend to undergo collagenization and lipidization. The typical early lesion of eosinophilic granuloma of bone was described as appearing grossly to consist of hemorrhagic cystic areas with brownish granulation tissue and microscopically as a sheetlike collection of large phagocytic cells interspersed among which are varying numbers of eosinophilic leukocytes and occasional phagocytic multinucleated giant cells. Jaffe and Lichtenstein stressed the benign character of eosinophilic granuloma and believed that the term should be retained to emphasize the clinical difference between it and Hand-Schüller-Christian disease.

### CLINICAL FEATURES

Most of the patients reported in the literature have been male. The vast majority of cases occur in young adults and children and although it is considered extremely rare in adults over the age of 40. Parkinson (12) reported a case in a 56-year-old man and Versiani et al. (13) reported a case in a 50-year-old woman. The lesion of bone may be solitary or multiple. Dundon et al. (14) in reviewing the literature up to 1946 found that of 53 cases reported 36 were solitary, 10 multiple and 7 uncertain. The bones most frequently involved are the skull, ribs, vertebrae, humerus and femur. Any bone may be affected but there are no reports in the literature of involvement of the hands or feet. The presenting signs of bony involvement may be pain and swelling. Usually there are no systemic symptoms but low-grade fever and weight loss may occur (15). Organs other than bones have been involved. Cases with cutaneous lesions histologically similar to the bone lesions have been reported (16, 17). A case has been reported in which eosinophilic granuloma of the mandible was associated with similar granulomas of the gum and palate (18). Lesions in the vertebrae and the skull have led to

- (12) Parkinson, T.: Eosinophilic xanthomatous granuloma with honeycomb lungs. *Brit. Med. J.* 1: 1029-1030, June 11, 1949.
- (13) Versiani O.; Figueiro J. M. and Junqueira, M. A.: Hand-Schüller-Christian's syndrome and eosinophilic or solitary granuloma of bone. *Am. J. M. Sc.* 207: 161-166, Feb. 1944.
- (14) Dundon, C. C., Williams, H. A. and Lalphy, T. C.: Eosinophilic granuloma of bone. *Radiology* 47: 433-444, No. 1946.
- (15) Solomon, H. A. and Schwartz, S.: Eosinophilic granuloma of bone. *J. A. M. A.* 128: 729-731, July 7, 1945.
- (16) Lever, W. F. and Loefer, R. W.: Eosinophilic granuloma of skin; report of case representing the two different diseases described as eosinophilic granuloma. *Arch. Dermat. & Syph.* 62: 85-96, July 1950.
- (17) Curtis, A. C. (Ann Arbor Mich.), and Cawly, E. P.: Eosinophilic granuloma of bone with cutaneous manifestations; report of case. *Arch. Dermat. & Syph.* 55: 810-818, June 1947.
- (18) Schroll, J.: Eosinophilic granuloma of bone: case report of eosinophilic granuloma of mouth (jaws, gum and palate) with simultaneous fistula in nose. *Oral Surg., Oral Med. & Oral Path.* 1: 256-264, May 1948.

various neurologic manifestations (19 20) Diabetes insipidus complicating eosinophilic granuloma of bone has been reported (12,21 23). Although it is considered unusual there have been several cases reported in the literature of eosinophilic granuloma with pulmonary involvement (10 12,21 32)

### ROENTGENOLOGIC FEATURES

Radiologically the bone involved show rarefied areas of varying sizes that may be irregular round or oval. The cortex may become eroded with resultant development of pathologic fractures and new bone formation. Serial roentgenograms may show rapid progression (33). Sclerosis of the margins of the lesion and periosteal thickening of long bones have been noted (14). There is no osteoporosis of surrounding bone. If the lungs are involved roentgenograms of the chest usually show a soft nodular infiltration throughout parts of one or both lungs as noted in the discussion of lung involvement in this paper.

(19) Osborne, R. L., Fries, E. D., and Lewis, A. G. Eosinophilic granuloma of bone presenting neurologic signs and symptoms, report of case. *Arch. Neurol. & Psychiat.* 51: 452-456, May 1944.

(20) Michels, P., and Morrison, H. C. Eosinophilic granuloma of the U. S. Navy. *M. Bull.* 45: 661-668, Oct. 1943.

(21) Ackerman, A. J. Eosinophilic granuloma of bone associated with involvement of lungs and diaphragm. *Am. J. Roentgenol.* 58: 733-740, Dec. 1947.

(22) Lewis, G. M. Eosinophilic granuloma of parathyroid gland, lungs, bones of the skull and ribs. *Arch. Derm. & Syph.* 60: 1007-1008, Nov. 1949.

(23) Traxler, E. R., and Niemeyer, D. Osseal and xanthomatous with pulmonary skeletal and cerebral manifestations, report of case. *Ann. Int. Med.* 23: 960-968, Dec. 1946.

(24) Poon et al., L. Bone lesions in eosinophilic granuloma, Hand-Schüller-Christian disease and Letterer-Siwe disease. *J. Bone & Joint Surg.* 30: 811-833, Oct. 1948.

(25) Correas, J. H., and Papp, W. C. Xanthomatous—Hand-Schüller-Christian type report of case with pulmonary fibrosis. *Am. J. M. Sc.* 205: 780-785, Jan. 1943.

(26) Lutz, A. E. Reticulo-endothelium with report of 2 cases. *Am. J. Roentgenol.* 34: 343-354, Sept. 1946.

(27) Weinstein, A., Francis, H. C., and Spofford, B. F. Eosinophilic granuloma of bone: report of case with multiple lesions of bone and pulmonary infiltration. *Arch. Int. Med.* 79: 176-184, Feb. 1947.

(28) Dickson, D. D. Eosinophilic granuloma of bone with diffuse pulmonary involvement. *California Med.* 69: 51-53, July 1948.

(29) Straus, B. Metabolic and inflammatory histiocytosis, with case report of Gaucher disease, Letterer-Siwe disease and eosinophilic granuloma. *Am. J. Med.* 5: 245-251, Aug. 1948.

(30) Arnold, H. L. Eosinophilic granuloma of bone: preliminary report of case complicated by lung lesions. *Proc. Staff Meet. Clin., Honolulu.* 12: 183-185, Sept. 1946.

(31) Zimmerman, H. H. Eosinophilic granuloma of bone. *Am. Pract.* 2: 121-124, Oct. 1947.

(32) Snapper, I. *Medical Clin. on Bone Diseases*, 2d edition. Interscience Publishers, Inc., New York, N. Y. 1949 pp. 192-193.

(33) Baker, W. J. (See Rouberty, M. A.; Houghton, J. D.; Wright, E., and Pettit, R. H. Eosinophilic granuloma, report of case with x-ray evidence of rapid progression. *New England J. Med.* 238: 626-629, Apr. 29 1948.

## LABORATORY DATA

Laboratory examinations are apparently of no help in making a diagnosis. A leukocytosis and eosinophilia have been noted but in most cases the white blood cell count is within normal limits. Also there is usually no anemia. Blood chemistry determinations including calcium, phosphorus, phosphatase, cholesterol, and blood lipids have been consistently within normal limits.

## THERAPY AND PROGNOSIS

Healing of bone lesions usually occurs after surgical excision, curettage or small amounts of irradiation but some have been known to heal spontaneously. Because the roentgenographic appearance of eosinophilic granuloma of bone may be indistinguishable from that of other conditions such as multiple myeloma, malignancy, osteomyelitis, and giant-cell tumor, a biopsy is indicated before therapy is started. It is considered by most authors that the disease is limited, usually showing complete recovery in a few months to a year but in cases with more widespread involvement as the one presented here the prognosis should be more guarded.

The following case is of special interest for two reasons. There is roentgenographic evidence of extensive pulmonary involvement and the patient was apparently made worse by ACTH therapy.

## CASE REPORT

A 24-year-old, white soldier developed several loose mandibular teeth while stationed in the Philippines in 1946. These were extracted but he was not told why they became loose and no further investigation was made. He then had no trouble until October 1949 when he noted a dull throbbing ache over the left hip while lying quietly in bed. The pain subsided after 3 or 4 nights and the patient remained asymptomatic until October 1950 at which time the pain recurred in the same manner as before. The degree and quality of the pain was the same but subsequently it occurred more often and was frequently precipitated by stepping down in the left foot suddenly or by twisting the left leg. In the latter part of October the patient had a routine dental examination and it was noticed that there was an abnormal recession of the alveolar ridges. A roentgenogram of the mandible revealed a large osteolytic lesion involving the symphysis. A bone survey revealed osteolytic lesions involving the pelvis and right lesser trochanter. The patient was then transferred to a general hospital for diagnosis and treatment.

Physical examination revealed marked atrophy of the alveolar ridges of the mandible bilaterally and the teeth were absent in these areas. The mucosa of the mouth was intact. A slightly enlarged lymph node of

normal consistency was palpable in the right xilla. There was dull deep pain in the area above the left acetabulum with abduction and external rotation of the left leg and there was some limitation of abduction.

With the exception of a positive tuberculin skin test with second strength PPD the findings were within normal limits. A roentgenogram revealed atrophy of the horizontal portion of the mandible on each side and a marked degree of bone destruction along the alveolar ridge (fig. 1). There was a large area of bone destruction in the left ilium in the region immediately above the acetabulum with destruction of the iliopectineal cortex (fig. 2). The area was surrounded by sclerotic bone. The roentgenogram of the right femur revealed areas of rarefaction in the lesser trochanter (fig. 3). There was a marked concavity of both superior and inferior surface of the bodies of the third, fourth, and fifth lumbar vertebrae (fig. 4). A roentgenogram of the chest revealed diffuse mottled soft infiltration throughout both lungs with numerous hilar and peripheral vascular bed calcific densities believed to be residual from old inflammatory disease and not related to present illness (fig. 5).

A biopsy specimen from the mandibular lesion revealed tan-gray, hemorrhagic friable tissue. Microscopically this was composed primarily of connective tissue element (fig. 6 and 7). The predominant cell was large mononuclear with finely granular and eosinophilic cytoplasm. There were scattered plasma cells and occasional giant cells of the Langhans type. Scattered throughout the background of cells were many eosinophils. A few areas of hemorrhagic necrosis were present. A diagnosis of eosinophilic granuloma of the mandible was made.

On 16 December treatment with 50 mg. of ACTH intramuscularly every 6 hours was started. On the second day of the therapy after the patient had received a total of 300 mg. of ACTH, he developed low back pain which increased in severity. Within 2 hours the pain was so severe he had to remain in bed. Any movement of the trunk, legs, or toes caused a sharp pain. Examination revealed tenderness over the fourth and fifth lumbar vertebrae and a moderate amount of spasm of the lower limb muscles. At the same time the patient began having a rise in temperature from 100 to 102 F. A roentgenogram of the lumbar spine revealed no change. Blood culture and urine culture were sterile. A smears of sputum were negative for enteric pathogens. On 18 December the patient began having pain in the left hip of moderate severity. On the third day the ACTH was decreased to 25 mg. every 6 hours and, because the temperature and daily temperature level on continued the ACTH was discontinued on 20 December after a total of 600 mg. had been given.

As the pain in the hip began to subside the patient continued to be in bed. On 27 December the low back pain had disappeared. On 27 December the patient began and the patient was given



*Figure 1. Roentgenogram showing destruction in the mandible. Figure 2. Roentgenogram showing destruction in the lateral cortex of the left ilium. Figure 3. Roentgenogram showing areas of rarefaction in the lower thoracic. Figure 4. Roentgenogram showing marked concavity of surfaces of lumbar vertebrae.*

total of 1 000 r over a period of 10 days. Shortly after this therapy was instituted the lumbar pain decreased slightly in severity and the temperature returned to normal but the pain continued to be severe enough to prevent ambulation. On 2 January 1951 irradiation of the left hip was started and a total of 1 130 r was given over an 8-day period. Following this course of therapy there was complete relief of the hip pain and the

patient had no trouble in moving his left lower extremity. At the conclusion of the x-ray therapy the patient began to have persistent low-grade fever varying between 99° and 100° F. Roentgen films of the hip, mandible, chest and lumbar spine taken months later revealed no change. The patient still had moderate low back pain, a low-grade fever and was not ambulatory. In the latter part of February irradiation of the

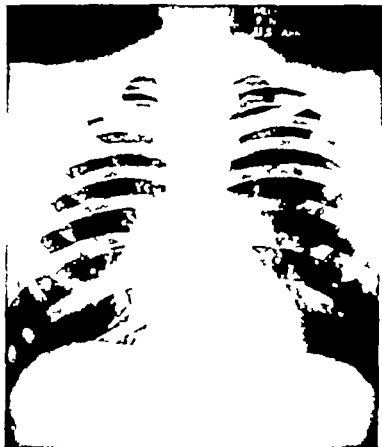


Figure 5. Roentgenogram showing infiltration and unconsolidated calcification throughout both lungs.

mandible began and total of 500 r was given over 10 sessions. The patient continued to show little improvement and the latter part of March when he became ambulatory with the aid of a black cane.

Roentgen films of the bones of the chest in June revealed no consolidation. It was noted that at that time the patient still had a low grade intermittent fever and coughing was difficult because of pain in the back and left hip.

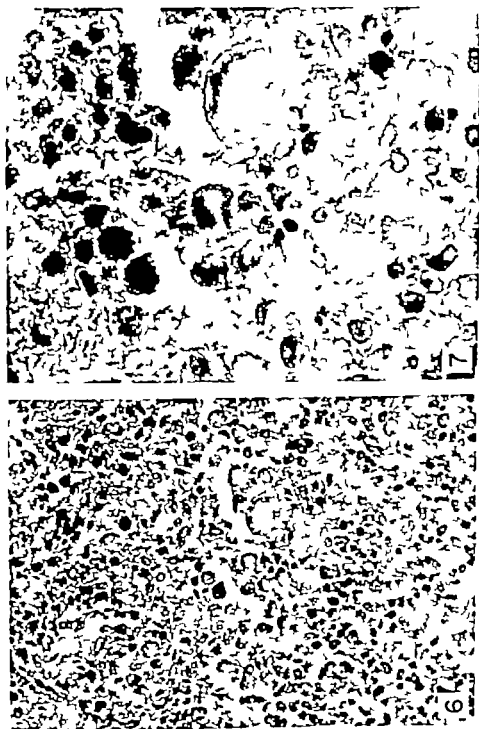


Figure 6. Section of tissue from mandible. 1. low. Figure 7. Same section as figure 6 with higher magnification.



## COMMENT

This patient developed fever, severe debilitating back pain and exacerbation of the hip pain while on ACTH therapy. Before therapy, as started roentgenograms showed concavity of the lumbar vertebral bodies suggestive of osteoporosis. Possibly the catabolic effect of ACTH on protein further depleted an already deficient osseous protein matrix in the lumbar vertebrae causing severe back pain. The exacerbation of pain in the hip also suggests that ACTH had no divers effect on the lesions of eosinophilic granuloma. Another interesting aspect of this case was the prolonged low-grade fever and disability which throws doubt on the much emphasized benignancy of this disease.

The pulmonary finding in this patient was unusual but apparently not so rare as formerly thought. In January 1951 16 cases (including the case here reported) that could be pathologically classified as eosinophilic granuloma of bone with pulmonary involvement had been reported (10,12,21,32). Six (14,21,25) of these had diabetes insipidus which is generally associated with Hand-Schüller-Christian disease but all had the typical bony lesion of eosinophilic granuloma with large numbers of eosinophils. Three of these had moderate amount of lipoid in the lesion from which specimen was taken and 3 had no demonstrable lipoid. Another case (10) that occurred in 5-year-old boy developed diabetes insipidus within year after the bony lesion and pulmonary involvement were discovered. A biopsy specimen in this case also revealed typical eosinophilic granuloma of bone.

In 12 cases the roentgenogram of the chest showed diffuse miliary infiltration or mottling throughout both lungs. The type of roentgenogram was also described as showing honeycombing and generalized reticulation or coarsening of the reticular pattern. On patient with this pattern had partial pulmonary involvement but in the rest both lungs were involved throughout. Roentgenogram of the chest of the other 4 patients reported were described as showing soft infiltration in both lung fields (6) diffuse pulmonary fibrosis (3), nodular fibrosis of the dorsal segment of the left lower lobe (21). No patient had no symptoms referable to the lung. One had dry cough (7), 1 had only short breath (12) and spontaneous pneumothorax occurred in 2 (23,32). None of the patients developed progressive or permanently disabling pulmonary symptoms. Twelve had multiple bony involvement, 3 had solitary lesion and the report of 1 made no mention of the number of bony lesions. The patients much higher percent of multiple bone involvement than the group of patients without pulmonary involvement reviewed by Dundon and L (14). None of the patients reported received pulmonary irradiation. 13 of the (26,27,30) marked clearing had light clearing (25) and the rest had no demonstrable improvement. The patients who were apparently undisturbed by the disease were followed by T. O. (4,31) cleared completely without treatment (4) and

Because none of the patients with eosinophilic granuloma and pulmonary involvement died the exact nature of the pathologic changes in the lungs are unknown but it seems logical to assume that the lesions are similar to those that occur in Letterer-Siwe disease and Hand-Schüller-Christian disease. Schafer (34) reported a 19-week-old infant with Letterer-Siwe disease who had a roentgenogram of the chest showing a fine honeycombing of the entire lung similar to that of the patient here reported. At autopsy there was widespread involvement of many organs. Grossly the air spaces of the lungs were flanked by thickened septums with mottled, yellow color giving them a "honeycomb" appearance. Microscopically the alveolar walls were found to be thickened because of an increase of cellular constituents consisting of atypical mononuclear cells, an occasional giant cell containing sudanophilic droplets and a few lymphocytes and eosinophils. As early as 1928 Rowland (35) described a fatal case of Hand-Schüller-Christian disease with pulmonary involvement. An autopsy revealed the lungs to be grossly a mass of pea-sized communicating vesicular cavities. The septums between the cavities were fibrous and elastic. Microscopically the reticuloendothelial cells around the pulmonary vessels showed hyperplasia and lipodosis and projecting into the large bronchi were papillary overgrowths of fibroplastic tissue and reticuloendothelial cells showing lipodosis.

Even though the above 2 cases and eosinophilic granuloma of bone with pulmonary involvement are vastly different clinically the gross pathologic descriptions of the lungs parallel the described honeycombing or reticular mottling of the chest films in eosinophilic granuloma.

### CONCLUSIONS

A patient with eosinophilic granuloma showing multiple bony and pulmonary involvement was apparently made worse by ACTH therapy. Typically the radiologic findings in the lungs may be described as a diffuse miliary infiltration or mottling usually involving both lungs. Usually there are no symptoms referable to the pulmonary involvement but cough, dyspnea and spontaneous pneumothorax may occur. Patients with pulmonary involvement are more likely to have multiple than solitary bone lesions. The pulmonary lesions are more likely to respond to x-ray therapy if it is given early in the course of the disease. The exact nature of the pathologic changes in the pulmonary lesions is unknown but it seems logical to attribute the roentgenographic findings to proliferation of reticuloendothelial cells in the alveolar septums. Because pulmonary involvement in eosinophilic granuloma of bone is not as rare as formerly thought it may be necessary to include in the

(34) Schafer, E. L.: Nonlipid reticulo-endotheliosis; Letterer-Siwe disease: report of 3 cases. *Am. J. Path.* 25: 49-83, Jan. 1949.

(35) Rowland, R. S.: Xanthomatosis and reticulo-endothelial system; correlation of unidentified group 1 cases described defects in membranous bones, exophthalmos and diabetes insipidus (Christian's syndrome). *Arch. Int. Med.* 42: 611-674, Nov. 1928.

differential diagnosis diseases that may effect both lungs and bones such as Boeck's sarcoid fungus disease malignancies with bony involvement and lymphangitic pulmonary spread and tuberculosis. A review of the literature further emphasize the close relationship of eosinophilic granuloma and Hand-Schüller-Christian disease but until definite cause is established the variable clinical findings and morphology of this disease will probably perpetuate the separate classification.

## BOOK REVIEW

*The Physiology of the Newborn Infant*, by *Clement A. Smith, M. D.*, Associate Professor of Pediatrics, Boston Lying-In Hospital, Harvard Medical School. 365 pages. 52 illustrations. Charles C. Thomas, Publisher, Springfield, Ill., 1951. Price \$7.50.

This book is an important contribution to medical progress in that it deals with the immediate neonatal period. It considers the physiologic change involved in the metamorphosis of the fetus in utero to that of the newborn infant. The metamorphosis includes (1) the setting of the circulation of blood, (2) the initiation of normal air breathing, (3) the substitution of renal for placental regulation of the internal environment and (4) the replacement of the placenta by the alimentary tract as source of food supply. When these changes reach physiologic completion the infant is born. The physician can readily realize the many ways in which this process may go wrong. The presentation of evidence, much of which has been gained by animal studies accompanied by excellent diagrams and graphic illustrations, will do much to orient the practitioner to the newborn. It demonstrates that many findings considered abnormal in the older infant are not necessarily abnormal in the immediate neonatal period. Perhaps it will encourage a more conservative approach in remedying these abnormal circumstances. The chapter on the neonatal aspects of respiration is particularly well presented and the clinical summaries at the end of each chapter are concise informative interpretations of the experimental data that can be of use to the clinician. This book should be readily available in the libraries of all physicians dealing with the newborn infant.—*Command E. R. Woeller MC USN*

# Eosinophilic Granuloma of the Rib

Sanford W. French III, Colonel, MC, U. S. A. (1)

**B**ECAUSE eosinophilic granuloma of the rib is not frequently encountered two cases are here reported.

*Case 1* A 21-year-old man entered this hospital on 3 December 1949 complaining of pain in the left side of the chest of 1-month duration. At the onset this pain was severe for about 4 days and was increased on deep breathing. The patient also had some pain in the left arm at this time. The pain in the left side of the chest, which was associated with coryza, then practically disappeared and the patient became relatively asymptomatic, but on 21 November a routine roentgenogram of the chest, taken in his local dispensary, revealed a lesion of the left fifth rib. After 2 weeks' observation in the dispensary the patient was then sent to this hospital where he stated he had slight pain in the left chest and that he was unable to sleep on his left side. This pain was accentuated on inspiration but there was no cough or any other pulmonary symptoms. There was no history of trauma. The patient had lost about 6 pounds in the month prior to admission.

On admission his temperature was 99° F, pulse rate 88, and respirations 18. His leukocyte count was 6,500 with 60 percent neutrophils, 36 percent lymphocytes, 2 percent monocytes, and 2 percent eosinophils. A roentgenogram of the chest revealed an area of osteolysis involving the left fifth rib in the posterior axillary line which measured about 4 by 2 cm. This area did not resemble an old fracture or osteomyelitis and appeared to be an osteolytic type of tumor (fig. 1). A skeletal survey, intravenous pyelograms, and serum calcium and serum phosphorus determinations threw no light on the diagnosis.

The patient's condition in the hospital remained about the same as on admission. About every other day his temperature would go up to 99 or 99.4° F. No preoperative diagnosis was made. A left thoracotomy was performed on 13 December with a block resection of 15 cm. of the left fifth rib beginning at the spine medially and extending out past the angle of the rib. This resection included the rib, intercostal muscles

(1) 118th Station Hospital.

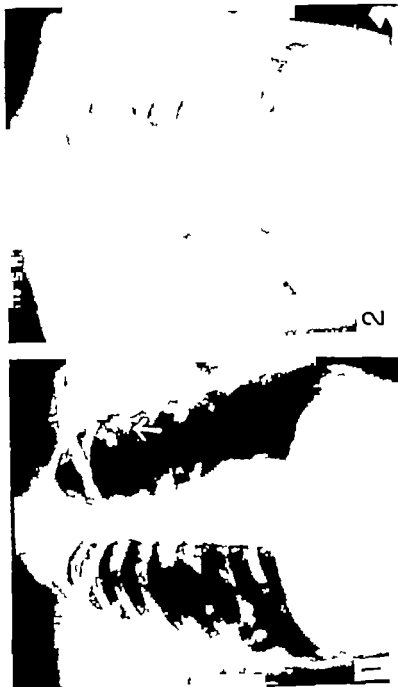


Figure 1 (top) shows patient the 1st day of the 1st fifth rib (the post rib iliac line) case 2 (case 1). The topographic / in of the 1st rib (12 day) after 1st ribotomy.

and pleura. The tumor was not broken into during operation. The removed specimen was then opened and examined. The tumor measured about 5 cm. in length and about 3 cm. in width. The rib substance was completely lost in the area of the tumor and had been replaced by a somewhat circular, mustard-colored soft tissue tumor mass, which had the consistency of a sea sponge. A fracture at the tumor site could have occurred at any time as there was just a shell of the rib cortex remaining. The pathologist reported eosinophilic granuloma. The patient was discharged from the hospital completely asymptomatic on 4 January 1950.

**Case 2** A 28-year-old man was admitted to this hospital on 31 December 1950 complaining of a constant pain in the right lower posterior portion of his thorax of 5 weeks duration. Five weeks prior to admission he had noted a sudden sharp pain in the right posterolateral part of the chest while lifting a heavy object. The pain was aggravated by exercise, lying in bed and coughing. The patient also complained of anorexia for the previous 2 months associated with slight general malaise. He attributed this to long hours and hard work in Korea.

Physical examination was negative except for a tender area over the anterior axillary line along the course of the right ninth rib. A firm mass measuring 2 by 2 cm. was palpable in the region of the angle of the right ninth rib. This mass appeared attached to the rib but not to the skin or surrounding tissues. The leukocyte count was 8,500 with 60 percent neutrophils, 34 percent lymphocytes, 5 percent eosinophils, and 1 percent basophils. A roentgenogram of the chest revealed a lytic lesion of the posterior arc of the right ninth rib about 4 cm. long and 2 cm. wide. There was no evidence of soft tissue invasion or bone production. A roentgenogram of the skull was essentially negative. A long bone survey revealed several osteomas about the left knee. A preoperative diagnosis of eosinophilic granuloma was made. On 12 January 1951 about 11 cm. of rib along with the intercostal muscle bundle on either side of the tumor was resected en bloc. The patient's postoperative course was uneventful and after 3 weeks of physical therapy he was returned to full duty.

The pathologist reported that the formalin-fixed specimen consisted of a segment of rib measuring 10.3 cm. in length. In the center of the specimen there was an expanded area having a fusiform shape. This measured 2.2 cm. in width, 1.1 cm. in thickness and 2.5 cm. in length. The rib had been broken in this area apparently following removal. The periosteum was elevated by the lesion and was intact as it passed over it. The cut surface through the expanded area had a light yellow-gray color with a faint brown mottling. Small bony spicules were scattered through the area.

The microscopic sections revealed a tumor composed of a variety of elements. The most prominent cell type was a large stellate or polygonal cell with an abundant eosinophilic or pale faintly vacuolated cytoplasm.

and round, oval or irregular nuclei. The nuclei were relatively uniform in size. They had a prominent nuclear membrane with a reticulated chromatic pattern. Mitotic figures were difficult to find. Scattered giant cells with from 3 to 8 nuclei were seen. Clumps and sheets of these cells were separated by varying amounts of dense fibrous connective tissue. There were many dense accumulations of eosinophils in the tumor. These were most prominent in association with the masses of at large shaped cells. Numerous dense accumulation of lymphocytes were found throughout the tissue. The tumor had penetrated the cortex of the rib but not the periosteum. There was marked subperiosteal new bone formation over the lesion. Diagnosis: Eosinophilic granuloma.

## BOOK REVIEW

*Simplified Nursing*, by Florence Dakin, R. N., former Inspector of School of Nursing, State of New Jersey and Ella M. Thompson, B. S., R. N., formerly President National Association for Practical Nurse Education; Member Job Analysis Committee United States Office of Education; Chairman, Production Committee of the Curriculum Committee United States Office of Education; formerly Consultant, North Atlantic Area American Red Cross Volunteer Nurse Aid Program, 5th edition. 730 pages, 78 illustrations. J. B. Lippincott Co., Philadelphia, Pa. published 1951.

This book has been re-edited to provide a new and interesting approach to the study of nursing for the practical nurse student. The arrangement of the chapters is logical beginning with the student's own understanding and care of themselves and their place in the nursing team. Anatomy and physiology of the human body in health and disease are adequately discussed before nursing procedures are presented. Emphasis is placed on the total care of the patient as well as on the patient as a person. The book is written in simple language easily understood yet stimulating enough to encourage the student to seek further knowledge. At the ends of the chapters are brief summaries of key points as well as especially good questions based on the situation. A reference list and glossary are included. Because this book follows the Practical Nurse Curriculum of 1950 set up by the United States Office of Education, it should be of real value in teaching hospital corpsmen in the service.

—Lt. Col. R. A. Houghton, MC, U. S. A.

# Regional Enteritis

Dan R. Sewell, *Colonel, U. S. A. F (MC) (1)*

John H. Wilkins, *Major U. S. A. F (MC) (2)*

SINCE the original description of regional enteritis by Crohn et al (3) the literature contains many articles reporting from 1 to 164 cases with suggested methods of treatment. Our purpose in this article is to refresh the mind of the surgeon about this condition which often so closely simulates appendicitis that a correct diagnosis is usually not evident until the abdomen is explored. For this reason the surgeon who undertakes abdominal operations should be capable of selecting and performing the surgical procedure most likely to arrest this condition, so often characterized by chronicity and a tendency to recur.

Regional enteritis is usually described as progressing through four stages although remission may occur without advancement through all steps. These various stages have been described as acute or irritative, chronic, obstructive and fistulous. The disease usually becomes manifest by an insidious onset of abdominal cramps, foul non-bloody diarrhea, nausea with occasional vomiting, and weight loss. The presence of fever varies with the stage of the disease, its presence being common when there is mesenteric involvement. The leukocyte count and sedimentation rate are generally elevated. Roentgenologic examination with barium is most likely to reveal a narrowing of the terminal ileum, the so-called "string sign" described by Kantor (4). The case presented herein is one which progressed to the fistulous stage although there was no evidence of a fistula at the time of the first abdominal exploration. There was, however, early evidence of a retroperitoneal abscess originating from the involved segment of terminal ileum.

## CASE REPORT

A 23-year-old man was admitted to the hospital complaining of attacks of nervousness, anorexia, and abdominal cramps associated

(1) United States Air Force Hospital, Keesley Air Force Base, Bermuda.

(2) Office of the Surgeon General, U. S. Air Force.

(3) Crohn, B. B.; Glasburg, L.; and Oppenheimer, G. D.: Regional ileitis: pathologic and clinical entity. *J. A. M. A.* 99: 1323-1329, Oct. 15, 1932.

(4) Kantor, J. L.: Regional (terminal) ileitis: its roentgen diagnosis. *J. A. M. A.* 103: 2016-2021, Dec. 29, 1934.



with nausea and vomiting of about 2 years' duration. The attacks appeared at weekly to monthly intervals and were associated with malaise, fatigue and gradual weight loss. Two days prior to admission vomiting occurred and was repeated from 6 to 8 times during the next 48 hours.

On admission the temperature was 100.2° F, pulse 88, and respirations 19. Two days following admission the patient complained of moderate pain and tenderness in the right inguinal region on movement of the right leg. Two days later nausea and vomiting reappeared and the abdomen was found to be tender to palpation in the right lower quadrant. The psoas sign was positive on the right. A diagnosis of appendiceal abscess was made and an exploratory laparotomy was performed. A normal appendix was found and was not removed. The terminal ileum was found to be involved in a chronic inflammatory process for about 20 inches proximal to the ileocecal valve as evidenced by induration, edema and rubber-tube-like consistency. There was a marked dilation of the ileum proximal to the involved segment. One portion of the involved segment was attached deep in the pelvis. Examination of the remainder of the bowel revealed no apparent involvement. To relieve the obstruction, side-to-side ileotransversocolostomy was accomplished proximal to the involved segment of the ileum. The attachment of the diseased segment in the pelvis was not disturbed. Postoperatively the patient was given lidiazine and penicillin parenterally a day, except for minimal intermittent diarrhea, convalesced normally until the seventh postoperative day when a low-grade fever appeared. There was tenderness to palpation in the right lower quadrant of the abdomen and right flank and the right hip was maintained in a flexed position. A inguinal incision was made on the twenty-second postoperative day and a large abscess containing about 500 cc. of foul pus was drained retroperitoneally. The temperature returned to normal and there was marked improvement in the extension of the right thigh. The patient became ambulatory. As the drainage wound closed, the fever and flexion deformity of the thigh returned. The wound was reopened twice for better drainage. Lipiodol injection of the sinus tract showed that it extended posteriorly to the plane of the lumbar plexus and anteriorly to the second lumbar vertebra (fig. 1). It was concluded at this time that the patient had a fecal fistula originating from the attachment of the involved loop of ileum within the pelvic area and that further operation was necessary. An abdominal celiotomy was performed. The anastomosis between the ileum and transverse colon was found to be functioning well. The terminal ileum involved in the disease process showed no essential change from the condition found at the first operation. In accordance with the method advocated by Garlock (5) the ileum just distal to the anastomosis was transected with closure of the open ends. The fever subsided.

(5) Garlock, J. H. Present state of problem of regional ileitis. *Am. J. Surg.* 72: 875-878 Dec. 1946.



Figure 1 (A) Site of incision for drainage of retroperitoneal abscess. (B) and (C) Limits of abscess cavity.

the draining fistula closed and complete extension of the right thigh was attained. Three weeks postoperatively barium enema was accomplished (figs. 2 and 3). The patient's condition was much improved and he was granted a 30-day furlough following which he was completely asymptomatic and had gained 20 pounds.

#### DISCUSSION

Cutler (6) believed that regional enteritis should be treated medically unless complicated by obstruction, fistula et cetera but most

(6) Cutler E. C. Neglected entry in abdominal pain and common diseases—crohn's enteritis. New York Stat. J. Med. 39: 328-337 Feb. 15 1939



Figure 2. (A) Site of incision was serotomized. Figure 3. (A) Incision was serotomized by incision of the skin above the incision site. (B) Site of incision was serotomized.

observers advocate operation in the chronic stage of the disease in order to avoid these complications. Pugh (7) in reporting his series of cases noted that 5 received penicillin and showed marked improvement. Our patient received about 40 million units of penicillin between the first and last operative procedures and the involved portion of his ileum showed little change on gross examination.

Kiefer and Ross (8) in reporting 107 cases concluded that in early acute enteritis without complications operation was best deferred because about 40 percent of their cases resolved satisfactorily. In chronic terminal ileitis with complications such as perforation, abscess formation and fistula formation, they recommended resection of the diseased portion of the terminal ileum and the ascending colon. They believed that side-to-side ileocolostomy without resection is unsatisfactory except as a preliminary step to resection.

Garlock and Crohn (9) in reporting 164 cases, urge ileotransversocolostomy in ileitis with exclusion of the involved portion by transection of the ileum proximal to the involved portion with closure of the open ends. They concluded that resection of the involved portion, whether in one or two stages is unnecessary. They found in most instances where resection was performed that the disease in the involved bowel was inactive and that fistulas closed spontaneously. In their cases where resections were performed, recurrences were more frequent and the mortality rate was higher. In 65 patients treated by ileotransversocolostomy with exclusion, there were no deaths and the recurrence rate was 10.5 percent. On the other hand 55 of their patients underwent a one-stage ileocolic resection with a 16.3 percent mortality and with a 15.4 percent recurrence rate. Two-stage ileocolic resections were performed on 25 patients with a mortality of 12 percent and recurrence rate of 28.6 percent. In 9 patients with ileocolitis treatment with resection resulted in a 10.5 percent mortality.

Garlock further indicated that ileotransversocolostomy with the diseased bowel left in continuity should not be performed because a stagnant pool of infected material results from which complications may arise. He described 4 patients who had come to him for chronic fistula following anastomosis with continuity of the diseased bowel intact, for whom cure was attained by simple transection of the ileum above the pathologic portion with closure of the open ends. The soundness of this principle is demonstrated by our case.

#### COMMENT

The case presented in this report was originally treated by ileotransversocolostomy with the bowel left in continuity. Following the

(7) Pugh, H. L.: Regional enteritis. *Ann. Surg.* 122: 845-861 Nov. 1945.

(8) Kiefer, E. D., and Ross, J. R.: Criteria in management of chronic ileitis. *J. A. M. A.* 129: 104-108, Sept. 8, 1945.

(9) Garlock, J. H., and Crohn, B. B.: Appraisal of results of surgery in treatment of regional ileitis. *J. A. M. A.* 127: 205-208, Jan. 27, 1945.

operation an extraperitoneal abscess and fistula appeared. After repeated drainage of the abscess exclusion of the diseased portion of the ileum was performed by transection between the previous anastomosis and an edved segment of bowel with closure of the open ends. There followed immediate remission of all symptoms. Although there is insufficient follow-up on this patient, it is desired to stress the rapidity with which exclusion of the diseased bowel gave relief. Good results were achieved in this case following the procedure recommended by Garlock which is associated with a lower mortality and a lower recurrence rate than procedures advocated by others. Furthermore this procedure is safer in the hands of the less experienced general surgeon. The average surgeon should consider such procedure when he is confronted with a chronic terminal ileitis complicated by obstruction, abscess or fistula formation.

## BOOK REVIEW

*Chronology of Ophthalmic Development, An Outline Summary of the Anatomical and Functional Development of the Visual Mechanism Before and After Birth*, by Arthur H. Kenner M. D., Will Ey Hospital, Philadelphia, Pa. Publication Number 99, American Lecture Series. A Monograph in American Lectures in Surgery 22 page. Charles C. Thomas Publisher Springfield, Ill., 1951. Price \$2.

This monograph is based on 3 charts the first of which shows the prenatal development of the orbit, extraocular vascular system, nerve supply and extraocular muscles, lens and capsule, optic nerve, hyaloid system and retinal circulation and the vitreous and suspensory ligaments from the third week until birth. The second chart shows through the same period the development of the retina, macula, choroid, lids, lacrimal apparatus, cornea, iris, ciliary body, ciliary muscles and Schlemm's canal. The third chart shows the postpartum development from the neonatal period to 20 or 25 years of the structures indicated in charts 1 and 2. There is also a short outline on the functional development of the visual system from the third fetal month until 9 years of age. The author states that the purpose of this outline—original only organization and in some cases interpretation—to be kept together in terse form and to compile for easy reference the currently established data concerning ophthalmic development. It does this very well and is an excellent reference pamphlet for ophthalmologists and medical students.—H. J. G. I. ALLEN II I. S. A. F. (MC)

# Management of the Neurogenic Bladder

James C. Kimbrough, Colonel, L. MC, U. S. A. (J)

**T**HE treatment of neurogenic bladder is definite from the time of injury until recovery or death and is based on fundamental principles. Any variation from these fundamentals will result in disaster for the patient and humiliation for the physician.

*Fundamental precepts.* As soon as the presence of neurogenic bladder is determined insert a urethral catheter and leave it in place until the patient recovers, dies, or has a cystostomy. Maintain continuous catheter drainage tidal or otherwise until the bladder recovers its function, or it is determined that the bladder will not recover. Perform a suprapubic cystostomy at the end of 4 weeks or earlier if bladder function does not show definite evidence of recovery provided the general condition of the patient offers reasonable life expectancy.

*Precautions.* Do not permit the bladder to become overdistended; do not depend on spontaneous overflow or manual expression of urine; do not depend on intermittent catheterization and do not keep the catheter in place in the presence of severe infection.

These are the fundamental principles of the treatment of the neurogenic bladder. They cannot be violated with impunity. All other measures such as nursing care to prevent decubitus ulcers, the use of urinary antiseptics and regulation of fluid intake are secondary considerations. A urethral catheter cannot be left in place indefinitely without serious consequences. Complications can usually be avoided for a period of from 4 to 6 weeks after which a cystostomy should be performed. The chief and almost the only problem of treatment is the prevention of infection and its complications.

*Cystometric studies* are valuable procedures in determining the condition of the bladder musculature. Early evidences of return of function are ascertained by this method before any clinical signs of recovery.

(J) Walter Reed Army Hospital, Washington, D. C.

are manifested. Simple apparatus is preferred. The water manometer adequate. The more complicated mercury manometers may be used by those who desire to carry out this examination in great detail. The Lewis cystometer is one of the latest and most complete types of apparatus available. The cystometrograms should be made as soon as possible and at monthly intervals thereafter. Cystoscopy should be performed before the fourth week and at monthly intervals thereafter. This procedure aids in the determination of bladder function and if small calculi are found they may be evacuated without operation. A cystoscopic table with trapeze should be available. It is important to ascertain the condition of the upper urinary tract. This can be done by excretory urography—at least every 3 months.

**Catheter care.** Use No. 16 3-cc. Foley bag catheter. Construction of the urethra about the catheter prevents drainage around the catheter and promotes infection of the urethra and epididymis. Change the catheter every 7 days. The catheter should be fixed to the abdomen to prevent pressure necrosis at the penoscrotal angle.

**Irrigation.** Use the closed system of irrigation, automatic tidal, manual tidal or other type. Irrigation should be carried out with buffered citrate solution or other modification of Suby's solution (2).

**General considerations.** Urin culture should be made every 2 weeks. Sensitivity test obtained and the proper urinary antiseptic prescribed. Renal function blood chemistry studies and other laboratory tests should be carried out as indicated. A calculus preventive regimen—diet fluid make upophol (Shorr technique) and early ambulation—should be kept in force. The urethra, external genitalia and perineum should be examined daily. Epididymis, periurethral abscess, urethritis or pyelonephritis should be met early by appropriate measures, removal of the urethral catheter and cystostomy drainage. Catheter or suprapubic drainage may be discontinued when an automatic bladder wash less than 100 cc. of residual urine has been developed. In regulatory patients bladder neck obstruction should be evaluated and transurethral resection performed when indicated. Testosterone may be used to prevent nitrogen depletion.

The paramount problem in the care of the neurogenic bladder is the prevention of urinary tract infection. Adequate drainage is essential to keep the bladder clear of bacteria. Rarely is it possible to maintain catheter drainage for long period without serious complications.

(2) Suby's solution 3-3 gram 1 cism. ac. to 3.8 gram 1 m. potassium citrate 4.4 gram 1 sodium carbonate (anhydrous) 4 distill d water to make 1,000 cc.

# Vivax Malaria With Long Incubation Periods

## Report of Seven Cases

E. E. Eddleman Jr *Lieutenant, MC, U. S. N. R.* (1)  
William H. Hale *Lieutenant junior grade MC, U. S. N. R.* (1)  
William M. Snowden *Commander MC, U. S. N.* (1)

ALTHOUGH the occurrence of malaria in military personnel returning from the South Pacific Area during World War II is well known (2-4), no report of malaria in Korean veterans has been found in the literature. This is a report of 7 proved cases of vivax malaria which were seen at this infirmary from May through July 1951 in military personnel having returned from Korea. These cases are of special interest because the symptoms of malaria occurred from 2½ to 8 months after their return to the United States.

## CASE REPORTS

*Case 1* Two days before admission this man first noticed malaise and nausea. He had a severe chill followed by fever the day preceding admission. It was noted after admission that the chills occurred about 48 hours apart the fever lasted from 4 to 8 hours following the chills. The patient had been stationed in Korea for 4 months during the summer and fall of 1950 but had been in the United States 8 months previous to the occurrence of the symptoms. Since his return, he had not been out of California. There was no previous history of malaria. He had received chloroquine suppressive therapy while in Korea. The admission diagnosis was influenza. The physical examination revealed an acutely ill man with a temperature of 104° F. The spleen was not palpable nor was there any enlargement of the lymph nodes. The

(1) U. S. Marine Corp. Air Station, El Toro (Santa Ana), Calif.

(2) Coggeshall L. T.: Malaria and filariases in returning servicemen; sixth Chad Franklin Craig lecture. *Am. J. Trop. Med.* 23: 177-184, May 1945.

(3) Noy, W. L., Jr.; Greene, C. C., Jr.; and Cheney, G.: Natural course of chronic Southwest Pacific malaria. *Am. J. M. Sc.* 211: 215-219, Feb. 1946.

(4) Baker, B. M., and Platt, D.: Vivax relapse rates following continued tablin suppressive medication; observation on malaria in infantry regiment. *Bull. John Hopk. Hosp.* 81: 295-304, No. 1947.



leukocyte count was 6,150 with a normal differential count. A blood smear for malaria, taken on the third hospital day, was positive for *Plasmodium vivax*. After giving 1 gram of chloroquine daily for 2 days he became asymptomatic.

**Case 2.** This man was admitted with chills, fever, headache, profuse sweating, and abdominal cramps. The illness was characterized by violent chills followed by fever occurring at intervals of about 48 hours for 1 week before admission. Between chills he had only mild abdominal cramps and headache. He had been in Korea from July 1950 until March 1951. He received chloroquine as suppressive therapy for malaria only during his first 3 months in Korea. He gave no history of previous malaria. His symptoms appeared about 3 months after his return to the United States. He was admitted with the diagnosis of malaria. The physical examination was negative except for splenomegaly. On the second day after admission, he experienced a shivering chill after which his temperature rose to 104° F. A blood smear for malaria at this time was positive for *P. vivax*. The leukocyte count was 2,600 with 81 percent lymphocytes. After the initiation of treatment, consisting of 2.5 grams of chloroquine given during a 36-hour period, the patient became asymptomatic.

**Case 3.** This man's illness began 4 days before admission with malaise and arthralgia. The day before admission, he had a chill followed by fever. Following admission, the chills occurred about 24 hours apart. The patient had had malaria in 1944 without a relapse. He had been in Korea from June 1950 to January 1951 and had returned to the United States 5 months before the onset of the present illness. He had not received any suppressive therapy for malaria while in Korea. He was admitted with a diagnosis of pneumonia. On admission, his temperature was found to be 104° F. The physical examination was negative. The spleen was not palpable. The leukocyte count was 7,000 with a normal differential count. Blood smears on the third hospital day were positive for *P. vivax*. The patient was given 2.5 grams of chloroquine over a 36-hour period. He was discharged on the fifth hospital day without symptoms.

**Case 4.** This man was admitted with chill, fever, malaise, and nausea present for 6 days. During that time the chills and fever occurred nightly. The patient had been in Korea from July 1950 until April 1951. He had returned to the United States about 2½ months before the onset of the present illness. There was no previous history of malaria. He had received chloroquine as suppressive therapy only during the first 2 months in Korea. The temperature on admission was 99° F, but a few hours after a chill it rose to 102.8° F. The physical examination was negative. The spleen was not palpable. The leukocyte count was 8,700 with slight lymphocytosis. The blood smear for malaria revealed *P. vivax*. He was given 2.5 gram of

chloroquine orally over a 36-hour period. He was discharged without symptoms on the sixth hospital day.

**Case 5.** This man's illness began 2 days before admission with malaise, headache, backache, and lethargy. The first chill occurred about 12 hours before admission, followed by a second chill 48 hours later. He had been in Korea from July 1950 until March 1951. He returned to the United States about  $3\frac{1}{2}$  months before the onset of symptoms. There was no past history of malaria. He had not received any suppressive therapy for malaria while in Korea. His temperature was normal on admission. The physical examination was negative except for a barely palpable spleen. The leukocyte count was 8,000 with a slight lymphocytosis. A blood smear for malaria revealed *P. vivax*. The patient was given 2.5 grams of chloroquine orally in a 36-hour period. He was discharged asymptomatic on the fourth hospital day.

**Case 6.** This man was admitted with a history of chills, fever, nausea, arthralgia, and headache of 2 days' duration. The diagnosis on admission was influenza. During hospitalization it was noted that chills and fever occurred every 48 hours. *P. vivax* were then demonstrated in a blood smear. The patient had been on duty in Korea from August 1950 until April 1951. He received chloroquine for the suppression of malaria only during the first 2 months of foreign duty. He had been returned to the United States about  $2\frac{1}{2}$  months before the appearance of symptoms. There was no previous history of malaria. On admission the temperature was 103° F. The physical examination was negative. The spleen was not palpable. The leukocyte count was 4,400 with a normal differential count. A blood smear for malaria taken during a chill was positive for *P. vivax*. The patient was given 2.5 grams of chloroquine orally in a 36-hour period. He was discharged asymptomatic on the ninth hospital day.

**Case 7.** This man became ill about 1 week before admission with a chill followed by fever. During the week he developed a microscopic hematuria and a diagnosis of hemorrhagic cystitis was considered. The chills were repeated at intervals of about 48 hours and were associated with backache and malaise. Malaria was then suspected as he had been in Korea from July 1950 until April 1951. He had received chloroquine for suppression of malaria only in April 1951. The symptoms of malaria appeared about  $2\frac{1}{2}$  months after he returned to the United States. He had no previous history of malaria. The temperature on admission was 104° F. The only significant finding on physical examination was a palpable spleen. The leukocyte count was 8,100 with a normal differential count. Blood smear revealed *P. vivax*. Two grams of chloroquine were administered on the first day, 1 gram on the second day, and 0.5 gram the following day. The patient became asymptomatic and was discharged on the third hospital day.

The symptoms in the 27 patients were typical of vivax malaria (11). The presence in 3 of them of vague arthralgia, malaise and chills without the 48-hour interval suggested clinical picture of influenza. Three of our patients had a palpable spleen which was a help in the diagnosis. The leukocyte counts were low or normal.

Because these patients had been in all of the major sections of Korea, no localization to probable endemic area could be made. Vivax malaria was the usual variety noted in veterans returning from the South Pacific Area during World War II (2). This variety tended to relapse frequently for as long as 3 years. Whether these cases of malaria, contracted in Korea, will also tend to relapse is not known. Types of *Vivax* is not the only variety of malaria seen in Korea. One case of falciparum malaria was reported during the Seoul campaign in September 1950 (11).

Chloroquine was the drug used in all of the cases and gave excellent clinical results. The regimen followed has been outlined (9). It consisted of 1 gram of chloroquine usually followed by 0.5 gram 6 hours and 0.5 gram daily for 2 days. Later maintenance dose of 0.5 gram/week was given. Chloroquine is probably the drug of choice for the treatment of vivax malaria because it has few undesirable side effects (11, 14) but relapses following it do occur frequently. Its effectiveness in controlling the acute symptoms of quartan lar (11) and curative for falciparum malaria (2, 9), so far as relapses have occurred in our experience. Toxic symptoms likewise been absent.

## SUMMARY

Seventy of plasmodium in Korean veterans were admitted to the infirmary between May and July 1951. Apparent incubation period of from 2 to 8 months were noted in these cases. All were treated with chloroquine with almost immediate results.

NOTE: Since the first relapse occurred, case 6.

1. American Association for the Study of Malaria. A Symposium on Human Malaria with Special Reference to North America and the Caribbean Region. Publication No. 1. The Association, Washington, D. C. 1941, pp. 153-159.

(11) Edgren, R. F. J. Personal communication.

(12) Barth, J. A., Lerman, S. A., and Fox, P. R. Larval observations on vivax malaria with chloroquine. (13) 1951 combined quarterly medical review, New York, 1951, 4-1, 4-2, Apr. 1, 1951.

(14) American Association for the Study of Malaria. F. P., Marshall, A. Christensen, H. P., and J. K. T. Abstracts of *Plasmodium vivax* malaria of foreign origin: comparison of new data. Arch. Int. Med. 77: 453-460, pp. 17-7.

(15) Barth, J. A., Lerman, S. A., and Fox, P. H.; Schmeidler, E. F. J. (1951) J. Am. Med. Ass. 150: 1000-1001. For treatment of vivax malaria (16) J. A. Barth, J. A. Lerman, S. A. Fox, and P. H. Schmeidler.

(17) Young, R. M., and F. J. D. Efficacy of Chloroquine against vivax malaria. (18) 1951 combined quarterly medical review, New York, 1951, 4-1, 4-2, Apr. 1, 1951.

# Present Concepts of Compensation for Fluid and Electrolyte Alteration

Smart H. Walker, Major MC, U. S. A.

THE remarkable resiliency of the body in compensating for fluid and electrolyte alterations has been apparent for many years but only recently have the mechanisms involved been elucidated. Consideration of these mechanisms is essential to the proper therapy of initial pathologic alterations and to the maintenance of fluid and electrolyte balance. The priorities on which the mechanisms depend must also be understood. Many factors operate simultaneously and the clinical findings are the result of the adjustments essential to maintain life. Therapy must follow a similar pattern and give priority to the most essential factors if it is to meet with success.

The factors most essential to body function which may be interfered with by fluid and electrolyte imbalance are (1) plasma volume (2) extracellular and intracellular osmolality and (3) pH. As long as these factors can be maintained within normal levels normal function will continue despite marked alteration in total fluid and electrolyte content. When any of these factors is significantly altered pathologic changes become rapidly apparent.

## CONTROL OF PLASMA VOLUME

An adequate plasma volume is essential for the transport of oxygen and metabolites to the central nervous system, the heart and the kidneys and for the carrying of carbon dioxide and waste products from these organs. The extremely dangerous effects of alteration of plasma volume have required that its maintenance receive first priority from homeostatic defense mechanisms. The chief mechanism by which plasma volume is maintained is by fluid transfer between the interstitial and intravascular fluid compartments. Elkington and Taffel (1) have shown that in a thirsting dog, body fluid loss is chiefly from the interstitial

(1) Elkington, J. R. and Taffel M.: Prolonged water deprivation in dog. J. Clin. Investigation 21: 787-794 Nov 1942

The symptoms of these patients were typical of vivax malaria (10). The presence of three of them (fever, arthralgia, malaise and chills) without the 48-hour interval suggested clinical picture of influenza. Three of our patients had palpable spleen which was a help in the diagnosis. The leukocyte count were low or normal.

Because these patients had been in all of the major sections of Korea no localization as to a probable endemic area could be made. Vivax malaria was the usual variety noted in veterans returning from the South Pacific Area during World War II (2). This variety tended to relapse frequently for as long as 3 years. Whether these cases of malaria, contracted in Korea will also tend to relapse is not known. Presently vivax is not the only variety of malaria seen in Korea. One case of falciparum malaria was reported during the Seoul campaign in September 1950 (11).

Chloroquine was the drug used in all of the cases and gave excellent immediate results. The regimen followed has been outlined (9). It consisted of 1 gram of chloroquine initially followed by 0.5 gram in 6 hours and 0.5 gram daily for 2 days. Later maintenance doses of 0.5 gram a week were given. Chloroquine is probably the drug of choice for the treatment of vivax malaria because it has few and small side effects (1-14) but relapses following it do occur frequently. It is effective in controlling the acute symptoms of quartan malaria (1) and curative for falciparum malaria (2-9). So far no relapses have occurred in our experience. Toxic symptoms likewise been absent.

## SUMMARY

Seven falciparum malaria in Korean veterans were admitted to the military between May and July 1951. Apparent incubation period of 2 1/2 to 8 months were noted in the cases. All were cured with chloroquine within 11 to immediate relapse.

Only one relapse occurred in case 6.

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(2) J. J. Severin, E. F. J. Personal communication. (3) J. J. Severin, E. F. J. Personal communication. (4) J. J. Severin, E. F. J. Personal communication. (5) J. J. Severin, E. F. J. Personal communication. (6) J. J. Severin, E. F. J. Personal communication. (7) J. J. Severin, E. F. J. Personal communication. (8) J. J. Severin, E. F. J. Personal communication. (9) J. J. Severin, E. F. J. Personal communication. (10) J. J. Severin, E. F. J. Personal communication. (11) J. J. Severin, E. F. J. Personal communication.

(12) J. J. Severin, E. F. J. Personal communication. (13) J. J. Severin, E. F. J. Personal communication. (14) J. J. Severin, E. F. J. Personal communication. (15) J. J. Severin, E. F. J. Personal communication. (16) J. J. Severin, E. F. J. Personal communication. (17) J. J. Severin, E. F. J. Personal communication. (18) J. J. Severin, E. F. J. Personal communication. (19) J. J. Severin, E. F. J. Personal communication. (20) J. J. Severin, E. F. J. Personal communication.

(21) J. J. Severin, E. F. J. Personal communication. (22) J. J. Severin, E. F. J. Personal communication. (23) J. J. Severin, E. F. J. Personal communication. (24) J. J. Severin, E. F. J. Personal communication. (25) J. J. Severin, E. F. J. Personal communication. (26) J. J. Severin, E. F. J. Personal communication. (27) J. J. Severin, E. F. J. Personal communication. (28) J. J. Severin, E. F. J. Personal communication. (29) J. J. Severin, E. F. J. Personal communication. (30) J. J. Severin, E. F. J. Personal communication.

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# Present Concepts of Compensation for Fluid and Electrolyte Alteration

Stuart H. Walker Major MC, U S A.

**T**HE remarkable resiliency of the body in compensating for fluid and electrolyte alterations has been apparent for many years but only recently have the mechanisms involved been elucidated. Consideration of these mechanisms is essential to the proper therapy of initial pathologic alterations and to the maintenance of fluid and electrolyte balance. The priorities on which the mechanisms depend must also be understood. Many factors operate simultaneously and the clinical findings are the result of the adjustments essential to maintain life. Therapy must follow a similar pattern and give priority to the most essential factors if it is to meet with success.

The factors most essential to body function which may be interfered with by fluid and electrolyte imbalance are (1) plasma volume (2) extracellular and intracellular osmolality and (3) pH. As long as these factors can be maintained within normal levels normal function will continue despite marked alteration in total fluid and electrolyte content. When any of these factors is significantly altered pathologic changes become rapidly apparent.

## CONTROL OF PLASMA VOLUME

An adequate plasma volume is essential for the transport of oxygen and metabolites to the central nervous system the heart and the kidneys and for the carrying of carbon dioxide and waste products from these organs. The extremely dangerous effects of alteration of plasma volume have required that its maintenance receive first priority from homeostatic defense mechanisms. The chief mechanism by which plasma volume is maintained is by fluid transfer between the interstitial and intravascular fluid compartments. Elkington and Taffel (1) have shown that in a thirsting dog body fluid loss is chiefly from the interstitial

(1) Elkington, J. R. and Taffel M.: Prolonged water deprivation in dog. J. Clin. Investigation 21: 787-794 Nov. 1942

phase of the extracellular compartment for the first few days and may amount to over 50 percent of the total extracellular volume without causing a significant change in plasma volume. The use of intracellular fluid to maintain the volume and osmolarity of extracellular fluid constitutes the large defense of plasma volume. The physiologic limit of this transfer is a loss of 30 percent of the intracellular compartment (1).

Gamble (2) has demonstrated that with rapid fluid loss from pyloric obstruction in dogs shifts of fluid from the intracellular to the extracellular compartment may take place to such a degree that a reduced osmolarity of the extracellular fluid results. This seems to indicate the relatively greater necessity of maintaining plasma volume than of maintaining osmolarity.

The control of water loss (and plasma volume) through the excretion of a concentrated urine is interfered with by the urea production from protein breakdown, the ketosis associated with diminished glucose intake and the excretion of potassium which is released from shifted intracellular fluid. Thus obligatory renal water loss in excess of normal minimal requirements is common under the condition of pathologic fluid imbalance. If an excessive rapid extracellular fluid loss occurs particularly if associated with red blood cell and protein loss fluid shifts from the interstitial and the intracellular spaces may be impossible. If efficiently rapid replacement of plasma volume and body spaces is depleted of the intracellular fluid compartment occurs, and the 30 percent limit then diminishes of plasma volume will appear in association with intracellular damage, but, short of extremely rapid fluid loss or marked depletion of intracellular fluid plasma volume is usually effectively maintained by fluid shifts from the interstitial and intracellular compartments.

### CONTROL OF OSMOLARITY

Maintenance of the normal osmolarity of the extracellular and intracellular fluids seems to be essential to the body for several reasons. Maintenance of the normal sodium-water ratio of the intracellular fluid is essential to the maintenance of plasma volume. Maintenance of the normal potassium-protein-water relationship in the intracellular fluid seems to be essential to cellular function as iteration in other directions may produce cellular damage. Temporary alteration in osmolarity continually occurs but intact renal function always restores the normal relationship. Apparently osmolarity is of secondary importance, however, as demonstrated by the dilution of extracellular fluid by intracellular water in treatment of major plasma volume.

The chief mechanism for the maintenance of osmolarity previously alluded to is the transfer of water between the extracellular and intra-

(2) Gamble, J. L., and Rose, R. G. Factors in dehydration following pyloric obstruction. *J. Clin. Invest.* 42: 413-423, June 1973.

cellular compartments when alteration of the osmolarity of either occurs (3). The osmolarity of the extracellular fluid depends on the sodium-water ratio as the other cations show little variation and derive from large body pools and the anions are automatically adjusted to the cation level by the presence of diffusible bicarbonate ions. The osmolarity of the intracellular fluid depends on the potassium-water ratio as cation replacement of potassium is available to only a limited degree and intracellular fluid anions may be readily transferred to the extracellular compartment and excreted. Water and electrolytes are required by osmolar pressure alterations across the cell membranes and therefore occur whenever alterations of proteins or cations occur.

Secondary adjustments are necessary to maintain the osmolarity of the compensating compartment and accurately to restore the osmolarity of each after alteration in either occurs. These adjustments are conducted by the kidney and do not occur in the absence of renal function (e. g. lower nephron nephrosis). Gamble (2) has shown that in association with a shift of intracellular fluid to the extracellular compartment, a proportional increase in the urinary excretion of potassium occurs. This is to be expected as necessary to the restoration of intracellular osmolarity. Because the extracellular concentration of potassium is low its transport to and excretion by the kidney is a slow process. Therefore the adjustment of intracellular osmolarity may be markedly delayed when extracellular alterations occur (4).

Darrow and Pratt (5) demonstrated that a more rapid compensation for osmolar changes exists in the shift of sodium between the intracellular and extracellular fluids whenever osmolar alteration in either compartment occurs. The normal intracellular sodium concentration is approximately equivalent to extracellular bicarbonate concentration and bears a direct relationship to this anion. Sodium may replace about one-third of a deficit of intracellular potassium according to Darrow and Pratt (5). They have shown that the maintenance of intracellular sodium at various concentrations depends on a comparable increase or decrease in extracellular bicarbonate. Chloride cannot pass the cell membrane and therefore in effect only the sodium available to combine with bicarbonate is free to shift intracellularly and maintain the diffusion of sodium ions into the intracellular fluid. Renal alteration of extracellular bicarbonate chiefly through alteration in chloride is achieved gradually to decrease the osmolar work of maintaining intracellular sodium and maintain this equilibrium.

The actual shift of sodium depends on the extracellular sodium concentration and the intracellular potassium concentration. Increased

(3) Gamble J. L.: *Clinical Anatomy, Physiology and Pathology of Extracellular Fluid*. Harvard University Press, Cambridge Mass. 1949.

(4) Darrow D. C. and Yasnet, H.: The changes in distribution of body water accompanying increase and decrease in extracellular electrolyte. *J. Clin. Investigation* 14: 266-275 Mar 1935.

(5) Darrow D. C. and Pratt E. L.: Fluid therapy: relation to tissue composition and expenditure of water and electrolyte. *J. A. M. A.* 143: 432-439 June 3 1950.



diffusion in the intracellular fluid is associated with elevated extracellular sodium or decreased intracellular potassium and increased diffusion into the extracellular fluid with diminished extracellular sodium or increased intracellular potassium. Morrow and Pratt (5) have shown that the shift of sodium to the intracellular compartment associated with extracellular water loss is diminished when extracellular sodium is decreased but nevertheless still occurs. In contrast, an increase in extracellular sodium (as produced by excessive parenteral administration of sodium) may cause displacement of potassium from intracellular fluid. Retention and increased shift of sodium into the intracellular fluid with loss of potassium from the intracellular fluid is the characteristic pattern of renal action in times of stress and can be detected in most conditions associated with fluid and electrolyte imbalance.

The result of this sodium shift is twofold. Most important, it constitutes an effective method of maintaining osmolality and always occurs in a direction opposite to the transfer of water between the fluid compartments. In addition, the immediate effect of transfer of sodium without chloride across the cell membrane is a alteration in the bicarbonate which acts as a buffer in the acid-base equilibrium. Initial alterations in bicarbonate occasioned by loss or increase in available extracellular sodium are gradually counteracted by renal compensation for the increased osmolar work of maintaining dissimilar extracellular bicarbonate and intracellular sodium concentrations. The necessity of reaching this equilibrium following an unusual alteration in sodium or potassium or both may create persistent alterations in extracellular bicarbonate.

The failure of water and sodium transfer and the adjustment of intracellular potassium to maintain osmolality is characteristically seen in adrenal insufficiency which indicates that control of renal tubule function by the distal gland depends on intracellular and extracellular osmolality. Impaired renal function caused by kidney disease or occurrence of consecutive of insufficient sodium for the excretion of water or result of insufficient water for the excretion of sodium will prevent the adjustment of osmolality. Renal failure of this type is frequently associated with terminal fatal and central nervous system dysfunction caused by the extension and disordered osmolality. It is a fatal price. Under such circumstances without renal function and distal gland function may accentuate rather than relieve the disorder of osmolality. The distillation of excessive water when sodium depletion exists or of excess sodium when water depletion exists causes an acute and alteration of extracellular osmolality and prevents the restoration of renal function.

Failure of control of osmolality because of rapid and excessive fluid and electrolyte loss may rarely result in extracellular hypotonicity because of the predominance of electrolyte concentration.

intestinal secretions. Commonly however the loss of electrolytes is counterbalanced by the failure of intake and the continued insensible water loss so that extracellular fluid osmolarity occurs early despite the intracellular water loss. In contrast, when failure of control of osmolarity occurs after fluid and electrolyte loss it usually results in extracellular fluid hypertonicity because of the excessive transfer of intracellular water in an attempt to maintain plasma volume (6). Failure of renal function and cessation of renal excretion of potassium may prevent such transfer however and thus permit a continued extracellular fluid hypertonicity. The type of osmolar failure which is present in any given case may be difficult to estimate without the determination of plasma ion concentrations. The common causes of extracellular fluid hypertonicity result in extracellular hypertonicity because the loss of water is relatively greater than that of electrolytes. These losses in turn produce intracellular water and potassium loss and require chiefly water and potassium replacement.

### CONTROL OF pH

The control of pH within the body fluids appears to be essential to the maintenance of certain enzyme systems, protein valency and calcium ionization but maintenance of pH seems to have third priority and alterations in this factor may even be induced by the compensatory mechanisms for the maintenance of plasma volume and osmolarity.

The chief mechanism for the control of pH is the bicarbonate buffer system and pH has been shown to be directly proportional to the bicarbonate/carbonic acid ratio (Henderson-Hasselbalch equation). Of the several agencies which control this ratio probably the most important is the kidney. The renal defense of metabolic alkalosis is effective because of the high bicarbonate/carbonic acid ratio which exists at an elevated pH and which permits a great increase in the base-bicarbonate excretion with but slight rise in urinary pH. When sodium depletion exists in association with alkalosis as occurs following vomiting the potassium, calcium, and magnesium released from their large body pools in defense of osmolarity are used in large quantities for the excretion of a basic urine. Thus reduction of plasma pH is achieved by the excretion of basic phosphate, basic organic acids, fixed anions and bicarbonate with fixed base instead of ammonium at the expense of extensive potassium, calcium, and magnesium loss. In the defense of metabolic acidosis sodium (and bicarbonate) is preserved by the excretion of organic acids and phosphates at a low pH the replacement of fixed base by ammonium, the increased excretion of chloride and the increased reabsorption of sodium. Attention of carbonic acid by primary changes in respiration is usually compensated for by one of the above mechanisms. Excessive loss of chloride or of potassium, calcium and magnesium is compensation for

(6) Gamble J. L. and McVer M. A. Effects of pyloric obstruction in rabbits. *J. Clin. Investigation* 1: 531-545 A. p. 1945.

alterations in the bicarbonate/carbonic acid ratio may result in persistent deficits after pH restoration.

Respiratory compensation through decrease or increase in the excretion of carbonic acid will prevent change in pH despite retention in bicarbonate within wide limits. Usually no change in pH will occur until the lower limit of ventilation required to prevent anoxia or the upper limit of ventilation is exceeded.

The third factor in the control of the bicarbonate/carbonic acid ratio is the previously discussed sodium shift between extracellular and intracellular fluids. Increase or decrease in extracellular sodium available to form bicarbonate immediately results in a corresponding change in intracellular sodium with a resultant diminution in the alteration of extracellular bicarbonate. Gradual renal compensation for this shift may, however, produce a persistent opposite alteration in bicarbonate as previously noted.

In addition to the bicarbonate buffer system, extracellular and intracellular proteins act as buffers of pH. Large alterations in protein valency and thus the combining power for base are associated with slight changes in pH and thus help to limit pH alteration. Failure of these mechanisms for the control of pH is associated with renal or respiratory diseases and with rapid excessive alterations in the sodium ions which determine plasma bicarbonate concentration. When renal disease exists, ammonium production is decreased, the ability to perform the osmotic work of sodium reabsorption is reduced (particularly in association with the polyuria necessitated by impaired urea excretion, proteinuria, glycosuria, or fixed specific gravity) and phosphate and sulfate ion retention occurs. Each of these deficits tends toward the reduction of extracellular bicarbonate and thus markedly hampers renal defense of metabolic acidosis; the therapy of metabolic acidosis in the presence of renal insufficiency must be cautious lest restoration of renal function and the administration of alkali solution produce osmotic rectum and metabolic alkalosis.

Respiratory disease may be associated with failure of pH control because of the inability of the kidney without respiratory assistance to maintain the renal bicarbonate/carbonic acid ratio. Pulmonary emphysema rarely is associated with sufficient elevation of carbonic acid to cause fall in pH, but excessive loss of carbonic acid caused by the hyperventilation of encephalitis, bronchodilation or salicylate intoxication may fall pH despite the increased renal excretion of base.

The maintenance of an excessive shift of sodium into the intracellular fluid requires an increased level of extracellular bicarbonate through renal control. A third mechanism for the control of osmoticity takes precedence over the control of pH: the kidney under these circumstances may produce hyponatremia which will persist until the restoration of intracellular potassium permits the reduction of intracellular sodium.

The maintenance of extracellular osmolarity is a complementary relationship between bicarbonate and chloride and thus the alteration in bicarbonate produced by the maintenance of an intracellular extracellular sodium shift is accompanied by a reciprocal alteration in chloride (renal compensation). The extracellular chloride concentration thus bears a direct relationship to intracellular potassium concentration and is a fairly good measure of the latter. This has been frequently demonstrated in the hypochloremia associated with primary potassium loss, excessive sodium administration although it is certain if renal function is adequate but such changes in chloride are important solely because they are associated with complementary changes in bicarbonate and pH.

The case history of a boy with severe fluid and electrolyte imbalance consequent to vomiting of psychic origin illustrates the principles which have been discussed.

### CASE HISTORY

Following 2 weeks of vomiting and decreased fluid intake a 7-year-old boy was given dextrose in water parenterally but no electrolytes. Thereafter he became stuporous, convulsed, showed evidence of marked renal insufficiency and only gradually returned to normal after intensive electrolyte replacement therapy.

*Stage 1—effective compensation.* Consequent to inadequate fluid and electrolyte intake and their loss in vomiting and by normal expenditures extensive depletion of these substances occurred but for a long time compensatory mechanisms were effective in maintaining normal plasma volume, osmolarity and pH. Compensation for plasma volume loss and extracellular hyperosmolarity was accomplished by a fluid shift from the interstitial to the intravascular phase and by a more gradual shift from the intracellular to the extracellular compartment. The latter occurred because of the increased osmolarity of the hypertonic extracellular fluid, the catabolic loss of protein and the withdrawal of potassium from the intracellular fluid.

In addition to the water transfer from the intracellular to the extracellular compartment, osmolarity was maintained by a shift of sodium. Until the hyperosmolarity of the extracellular compartment was adequately reduced, sodium was transferred from the extracellular to the intracellular fluid, but following marked sodium loss maintenance of extracellular osmolarity required a shift of sodium back to the extracellular compartment. Thus the sodium shift was a sensitive and effective stabilizer of extracellular osmolarity. Decrease in the potassium content of the intracellular fluid occurred consequent to inadequate intake, loss in gastric fluid, and chiefly to increased urinary excretion. This latter was consequent to protein loss and the reduction of intracellular osmolarity necessitated by water transfer to the extracellular compartment.

The increase in extracellular bicarbonate consequent to chloride loss was effectively compensated for by the increased renal excretion of potassium, calcium, and magnesium in a basic urine. In addition, the development of ketosis associated with inadequate carbohydrate intake and the decrease in renal function consequent to inadequate water intake compensated for bicarbonate elevation by increasing fixed anion concentration. The early sodium shift from the extracellular to the intracellular compartment also helped to decrease extracellular bicarbonate concentration. In addition to these mechanisms for the reduction of bicarbonate, decreased ventilation with retention of carbonic acid maintained the bicarbonate/carbonic acid ratio at a normal level. Thus, compensation was effective in maintaining plasma volume, osmolality, and pH at the expense of extensive loss of extracellular and intracellular volume, water, sodium, potassium, and chloride.

*Stage 2.—failure of compensation.* Because of the development of cellular damage consequent to the excessive shift of intracellular water or the sudden increase in extracellular water loss, plasma volume could no longer be maintained and signs of shock appeared. Extracellular osmolality was sacrificed in order to maintain plasma volume through the dilution of extracellular electrolytes by the transferred intracellular water. Normal pH might still have been maintained despite the bicarbonate elevation consequent to chloride loss by the effects of ketosis and the renal failures associated with reduction in plasma volume.

*Stage 3.—correction with water and dextrose.* At another hospital, large amounts of water and dextrose without electrolyte were administered to correct the loss of plasma volume. This was completely accomplished at the expense of further reduction in extracellular osmolality. Renal function could not be adequately restored because of inadequate base for the excretion of water and thus the administered water was shifted from the already hypotonic extracellular to the intracellular compartment resulting in marked cellular hyperhydration and hyposmolality (7). Because of the excessive retained water, mild edema became clinically apparent, no change in pH occurred although ketosis was corrected by the administration of dextrose. Poor renal function compensated for the chloride loss. If sodium and chloride had been administered at the same time as is usual in the treatment of vomiting, renal function would have been restored and excessive intracellular hyposmolality corrected, but with the restoration of renal function and loss of ketosis, marked elevation of bicarbonate and alkalosis might have immediately resulted. Bicarbonate elevation would have been maintained by renal function in order to maintain the elevated intracellular sodium concentration necessitated by potassium loss, and thus alkalosis might have persisted despite chloride restoration and return of renal function.

(7) Stewart, J. D., and Forster, G. M.: Effect of large isosmotic infusions on body fluid. *J. Clin. Investigation* 21: 197-205, Mar. 1942.

*Stage 4—correction with electrolytes* When this child was first seen his plasma volume had been partially restored and his pH was normal but the marked disturbance of intracellular and extracellular osmolarity was evidenced by renal insufficiency hypertension, edema coma and repeated convulsions with long periods of apnea and cyanosis. His urine was scanty and showed 3 plus albumin. The blood nonprotein nitrogen was 161 mg per 100 cc and the creatinine was 7.9 mg. per 100 cc. The carbon dioxide combining power was essentially normal and the plasma pH was 7.35. The plasma chloride of 68.2 mM per liter and a plasma sodium of 136 mM. per liter indicated that a large increase in other anions (sulfate phosphate and organic acid) was also present. The plasma potassium was 3.7 mM per liter and the plasma calcium was 10.3 mg. per 100 cc. With the plasma hypoosmolarity the total plasma volume was markedly reduced as indicated by the red blood cell count of 6.2 million. As pH, potassium, and calcium levels were not markedly altered it can be assumed that marked intracellular and extracellular hypoosmolarity accounted for the central nervous system manifestations and the renal failure.

Early rapid administration of sodium chloride and of potassium, calcium, and magnesium in as large amounts as could be tolerated produced restoration of intracellular and extracellular osmolarity and rapid return of renal function with cessation of convulsions and respiratory dysfunction. About 4 days elapsed before the plasma volume plasma nonprotein nitrogen, sodium, and chloride levels were restored to normal. No significant alteration in pH was noted at any time. The administration of potassium, magnesium, and calcium undoubtedly prevented persistent pH elevation and the tetany which is frequently associated with the post therapeutic shift of these ions to the intracellular pools. By the eighth hospital day the urine, blood pressure plasma electrolyte values, and the renal function were entirely normal. The adrenal effect which had achieved retention of sodium and maintained extracellular fluid volume at the expense of a large potassium loss was evidenced by an initial lymphopenia and an absence of eosinophils.

The return of normal cerebral function was markedly delayed. The child was irrational with extreme emotional lability until the end of the first hospital week. While he was receiving 5 grams of potassium chloride in addition to a normal diet, the hypotonia weakness generalized areflexia and irrationality disappeared, but electroencephalographic evidence of cerebral damage, though markedly improved was still present more than 3 months later.

### CONCLUSIONS

In fluid therapy it is important to restore the plasma volume normal osmolarity and normal pH in that order but as these factors are closely interrelated, consideration must be given to the restoration or main-

tenance of all three simultaneously. The following pattern for parenteral fluid administration is suggested:

1. The restoration of plasma volume with intravenous administration of blood plasma or hypertonic dextrose solutions.

2. The restoration of extracellular osmolarity by the intravenous administration of either hypertonic, isotonic, or usually hypotonic (dependent on the initial osmolar alteration) sodium solution such as Ringer's lactate solution.

3. The restoration of pH by the intravenous administration of 1/6 molar sodium lactate or sodium chloride solution (dependent on the initial alteration). The amount of sodium administered as replacement should not exceed 12 mEq. per kg. of body weight.

4. The restoration of intracellular osmolarity (as soon as renal function is reestablished) by the intravenous or subcutaneous administration of potassium-containing solutions. The maximum safe dose is 3 mEq. potassium per kg. of body weight per day.

5. The replacement of the calcium and magnesium deficit with calcium gluconate given intravenously and magnesium sulfate given intramuscularly.

6. Compensation for water, sodium, chloride, potassium, dextrose, protein, and vitamin expenditures during 24-hour periods by intravenous, subcutaneous, or oral administration.

7. Early resumption of oral intake should be attempted. Potassium intake must be kept high.

The dangers of fluid therapy should be considered and avoided.

# Presacral Neurofibroma

George Alvary Major U S A. F (MC) (1)

**N**EUROFIBROMA is one of a large variety of neoplasms that may be attached to the anterior surface of the sacrum. These presacral or retrorectal tumors present an interesting problem that frequently requires the combined skills of the surgeon, urologist, gynecologist, radiologist, and pathologist for their diagnosis and management. The classification and treatment of these lesions has been well presented in 2 recent reviews (2,3). Presacral tumors are rare. At the Mayo clinic they occurred only about once in every 10,000 female patients (3). The case here reported brought up several interesting problems that will no doubt face other surgeons who operate on tumors in this region.

## CASE REPORT

A 26-year-old married woman was admitted to the hospital on 31 January 1951 complaining of backache and pains of 5 months' duration radiating down the back of her right thigh. Her children, 3 years and 20 months old respectively, were both born without complications. Records of these deliveries contained no mention of the presence of a pelvic mass.

Her blood pressure on admission was 96/60. Pelvic examination revealed a mass the size of an orange protruding from the anterior surface of the sacrum into the pelvis for a distance of about 7 cm. The mass was firm and somewhat tender. Its uppermost point was just below the sacral promontory. The mass was definitely retroperitoneal and was firmly attached to the sacrum. The rectum and sigmoid were freely movable as were the uterus and adnexa which were pushed forward and to the left by the tumor. A roentgenogram of the sacrum (figs. 1 and 2) revealed a large defect on the right side that extended across the midline to the opposite ilium. The bony margin of this defect was smooth but loculated. There were no calcium deposits to indicate a teratoma. A barium enema revealed the rectosigmoid displaced somewhat to the

(1) Westover Air Force Base, Mass.

(2) J. Eklund, R. J.; Clark, P. L., III, and Smith, L. D.: Retrorectal tumors. *J. A. M. A.* 145: 936-962, Mar. 31, 1951.

(3) Lovelady, S. B., and Dockerty, M. B.: Extragenital pelvic tumors in women. *Am. J. Obst. & Gynec.* 58: 215-236, Aug. 1949.



[illegible]

left. An intravenous pyelogram (fig. 3) revealed mild excretory response on both sides. The renal architecture showed a doubling of the left ureter in its upper two thirds. The right ureter showed a definite posterior lateral deviation in its distal portion, consistent with the presence of a mass extending from the right renal area.

A diagnosis of paraneural tumor was made and an exploratory laparotomy was performed. Once it was ascertained that we were not dealing with an ectopic pelvic kidney, it was planned to take a specimen for biopsy and, if warranted by gross appearance and frozen section, to perform an immediate resection and if the frozen section should prove to be conclusive, to delay further treatment until the final report became available.

The abdomen was entered through a right para-median incision from the umbilicus to the symphysis. There was no free fluid in the abdomen and the tumor was found to be entirely retroperitoneal. In pale exposure, the posterior peritoneum was opened over a distance of 10 cm. from the insertion of the ureter to the bottom of the cul-de-sac. The tumor was a roughly globular mass of solid, firm consistency, contained in a thick, fibrous capsule which was firmly adherent to the serosa. The cut surface was light brown. The pathologist present declined to make a definite diagnosis because of the extreme vascularity about the tumor; it appeared doubtful whether the bleeding could be controlled after an attempted removal. After a small piece of the tumor had been removed,



FIGURE 4.—Gross specimen showing the isolated and encapsulated tumor which is the tumor protruding into the pelvis.

hemostasis was secured with fibrin foam and suture ligatures through the capsule. Despite all precautions it is estimated that from this relatively minor procedure the patient lost between 500 and 700 cc of blood which was replaced during the operation.

The specimen was sent to the First Army Laboratory which reported a "benign tumor presumably of neurogenic origin. The specimen was also shown to Dr. Arthur Purdy Stout of Columbia University who reported it a "presumably neurofibroma.

Twelve days later the tumor was resected through a left paramedian incision. The posterior peritoneum was opened from the level of the bifurcation of the aorta down to the bottom of the pouch of Douglas. This exposed the tumor capsule. The tumor extended from the sacral promontory to the coccygeal articulation, reversing by its bulge the normal convexity of the sacral hollow. It was possible to shell the tumor out of its capsule to which it adhered only by a few trabeculas that were divided by finger dissection. The capsule itself was firmly fused with the periosteum of the sacrum but there was no evidence of invasion. The proximal portion of the tumor had undermined the sacrum to a distance of 2.5 cm. above the level of the promontory by a cephalad extension within the body of the fifth lumbar vertebra. This is a rather typical finding in presacral neurofibroma and has been described by most surgeons who have operated on these tumors. After removal this resulted in an area of raw bone from which blood oozed freely.



Figure 3. Gross specimen showing the posterior aspect of the sacrum. Note the bare convolutions of the



Figure 6. Sagittal section through the specimen. The free surface is shown above and the surface attached to the sacrum below. The solid central portion is surrounded by irregular convolutions.

With the patient lying on her back this surface faced downward and hemostasis except by packing was extremely difficult. Inspection of the tumor bed showed removal of the tumor to be complete. Oozing was finally controlled with fibrin foam and gelfoam pledgets saturated in thrombin solution. The tumor was an avascular yellow-brown solid mass and weighed 185 grams (figs 4, 5 and 6).

At this point the question came up whether to close the peritoneum by simply approximating the posterior cut edges or whether it would be better to pack the newly created space (the tumor bed and the raw sacral defect) a potential postoperative bleeding hazard allowing the gauze to protrude through a posterior colporrhaphy for subsequent removal.

The former procedure would result in a quick accumulation in the tumor bed of blood that would clot and eventually be absorbed. Packing would prevent the formation of any large dissecting hematoma with possible infection or leakage into the general peritoneal cavity. On the other hand it would be difficult to insure against the pressure effect of the pack on the nerves of the sacral plexus that emerge in that area. Furthermore the packs would have to be removed presumably under anesthesia. It was decided to close the posterior peritoneum tightly and without drainage.

During the second operation the patient lost about 500 cc of blood which was replaced immediately. She stood the procedure well and was discharged from the hospital on the thirteenth postoperative day.

Examination 1 week after operation revealed a large firm hematoma occupying the former site of the tumor. Six weeks later this had diminished to nearly one half its original size and 6 months later was no longer palpable. Although the patient showed no weakness of the muscles of her lower extremities she complained of patchy areas of tingling and examination showed corresponding areas of hypesthesia on the inner aspect of the right thigh and posterior surface of the right calf.

The pathologist reported a discoid rubbery tumor which weighed 182 grms and measured 11.4 cm. inferosuperiorly, 6.7 cm. laterally and 6 cm. anteroposteriorly. When viewed anteroposteriorly (fig. 4) it had an oval outline but the lateral view revealed it to be crescent-shaped with its convexity on the anterior surface. The anterior and lateral surfaces were slightly lobulated and bore a thin transparent capsule through which a light tan tissue could be seen. The posterior surface (figs. 5 and 6) was irregular, bore no capsule and revealed golden tan tissue. Microscopic examination showed the tissue to be composed of spindle-shaped cells containing fusiform nuclei and displaying no distinct cellular borders. In many fields the tissue formed a wheel-like pattern which gave it the histologic pattern of the so-called Verocay bodies. In other areas the stroma was composed of foamy macrophages, a finding interpreted as evidence of degeneration of the tumor mass. No evidence of malignant change was encountered.

#### DISCUSSION

The symptoms of presacral tumors are vague. Backache is the most common complaint. Pain in the leg and bladder and bowel dysfunction are less common. Paraesthesias and difficulty in walking occasionally occur. Hemorrhoidectomies were performed on 5 patients of Jackson's series (2). Others were operated on for ovarian cysts. Physical findings are often not diagnostic as to the type of tumor. The diagnosis has to be decided by the pathologist. From the pathologic point of view these lesions may be classified as congenital neurogenic and miscellaneous (2).

The neurogenic group comprises neurofibromas, ependymal cell gliomas, ganglioneuromas and ependymoblastomas. The most common of these the neurofibromas are usually seen in young women whose ages range from 17 to 35 years (3). Being symptomless they are frequently discovered accidentally. Some are found to arise from the obturator nerves and others from the anterior sacral nerve. In some it is difficult to ascertain the nerve of origin. The tumors average about 9 cm. in diameter and are encapsulated and yellow. They are smooth, dumb-bell in appearance protruding from the left or right side of the pelvis. Exhibiting large intra-pelvic and extra-pelvic parts. Removal had to be done in stages. Another patient presented normally to present a similar situation gave a history of two operative attempts at removal. The residual tumor was difficult to enucleate and the patient is believed to be free of recurrence. In still another patient, the adherence of the tumor to the sacrum of a large pelvic neurofibroma was responsible for the hemorrhage at removal that the patient died shortly after (3).

Reports such as these made us hesitant and puzzled us in the matter of whether or not to remove this tumor by exploration. In order to prevent recurrences a complete removal of these tumors is essential especially as some of them are malignant although they are classified as benign. Because of the vast extent of the area immediately surrounding the tumor as well as the raw surface of sacral bone which has to be left behind it is well to anticipate a large loss of blood and to have plenty of blood available for transfusion during operation. The ependymomas represent unusual extensions of gliomas of the spinal cord and treatment of these extensive growths is unsatisfactory.

Lesions arising in bone are the benign giant cell tumor, the cartilaginous and osteocartilaginous groups, osteogenic sarcoma, Ewing's tumor and chordoma. In all of these except slow-growing tumors exhibiting an admixture of bone and cartilage the prognosis is poor.

The miscellaneous group consists of inflammatory masses often secondary to anal fistulas, fibromas and metastatic carcinomas. The treatment of most of these is surgical removal. Roentgen radiation and radium are important aids in the treatment of these tumors. Hemorrhage usually from the presacral plexus of veins constitutes the greatest hazard associated with complete removal. Interesting problems arise when these tumors are complicated by pregnancy. It is usually not advisable to perform a therapeutic abortion on patients with these tumors because most of them are benign and those that are malignant with a few exceptions grow slowly. Their rate of growth is not affected by pregnancy. If the tumor is believed to be large enough to obstruct labor it is best to allow the pregnancy to proceed to term and to perform a cesarean section. Subsequent removal of the tumor can then be carried out.

## BOOK REVIEW

*Inhalation Anesthesia, A Fundamental Guide* by Arthur E. Gould, M. D.,  
Associate Clinical Professor of Surgery (Lunenburg), University of  
Southern California School of Medicine. 2d edition. 143 pag. The  
McGraw-Hill Co., New York N. Y. published 1951. Price \$3.75.

In this new edition the author has successfully improved on a monograph which for many years has been accepted by teachers and students in the field of anesthesia as a standard text. By the inclusion of many of the advances made in the last 15 years he has brought his book up to date and has at the same time retained the concise and simple descriptions for which it has been acclaimed since its first printing. The introductory chapter has been revised to include a brief discussion of the physical laws which serve as the basis for the successful administration of inhalation anesthesia. The use of premedicant drugs is also discussed in the light of their pharmacologic background. In the first edition, the section describing the signs of anesthesia is a classical presentation of this vital aspect of the subject. In the revision however the author has increased the value of this section

including variations in the signs of anesthesia which have occurred as a result of the introduction of new drugs such as cyclopropane, ether, and curare. Newer techniques such as the use of endotracheal catheters and the closed system carbon dioxide absorption apparatus are mentioned and their fields of application indicated. The chapters devoted to complications and accidents during anesthesia have been revised to include of such recently developed procedures as cardiac resuscitation in the treatment of cardiac anesthesia, and endotracheal intubation of respiratory complications is fully discussed in the 11 factors responsible for these

Extraneous details are carefully avoided. It is made to present material of practical value in the practice of anesthesia. The author points out the trend away from the use of curare and other paralytic agents in anesthesia — W. J. H.

# The Clinical Effects of Delta 5 Pregnenolone in Rheumatoid Arthritis<sup>(1)</sup>

Alton R. Higgins *Captain, MC,*

Richard E. Jones Jr. *Lieutenant, junior grade*

Thomas W. D. Smith *Lieutenant, junior grade*

**F**OLLOWING the spectacular clinical improvement in rheumatoid arthritis which followed the administration of cortisone by Hench et al (2) a number of other steroids have been investigated in the therapy of this disease. Among these, delta 5 pregnenolone has been used in the treatment of rheumatoid arthritis with variable reports as to its value.

Davison and Koets (3) observed a decrease in 17-ketosteroid excretion following the administration of pregnenolone to patients with rheumatoid arthritis. Subsequently Davison et al (4) reported improvement in most patients with rheumatoid arthritis following the intramuscular injection of from 100 to 300 mg. of pregnenolone daily, improvement usually occurring within from 3 to 7 days and with complete regression of symptoms and disappearance of objective findings in from 2 to 4 weeks. Cohen et al (5) observed clinical improvement in 9 of 9 patients with rheumatoid arthritis treated with pregnenolone alone and in 93 percent of 31 patients treated with pregnenolone or with pregnenolone

(1) From the Metabolic Research Facility, U. S. Naval Hospital, Oakland, Calif.

(2) Hench, P. S.; Kendall, E. C.; Slocumb, C. H.; and Polley, H. F.: Effect of hormone of adrenal cortex (17-hydroxy-11-dehydrocorticosterone compound E) and of pituitary adrenocorticotrophic hormone on rheumatoid arthritis. *Proc. Staff Meet. May Clin.* 24: 181, 1949.

(3) Davison, R. A. and Koets, P.: Effect of delta 5 pregnenolone on urinary 17-ketosteroid excretion and symptomatology of ankylosing spondylarthritis; preliminary report. *Ann. Rheumat. Dis.* 8: 305, Dec. 1949.

(4) Davison, R.; Koets, P.; Snow, W. G.; and Gabrielson, L. G.: Effect of delta 5 pregnenolone in rheumatoid arthritis. *Arch. Int. Med.* 85: 465 Mar. 1950.

(5) Cohen, A., Goldman, J.; and Dobbs, A. W.: The use of pregnenolone and combined steroids in the treatment of rheumatoid arthritis. *J. Philadelphia Gen. Hosp.* 11: 170, Oct. 1950.



## BOOK REVIEW

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Extraneous detail is carefully avoided and a conscientious attempt is made to present material of value to those engaged in the clinical practice of anesthesia. The revisions found in this new edition clearly point out the trend away from the art of anesthesia toward the science of anesthesiology.—*Maj. H. P. Makel, MC, U. S. A.*

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(5) Cohen, A., Goldman, J. and Dubbs, A. W. The use of pregnenolone and combined steroids in the treatment of rheumatoid arthritis. *J. Philadelphia Gen. Hosp.* 1: 120 Oct. 1950.



2 months to 20 years. The functional capacity of the patients classified according to the therapeutic criteria adopted by the American Rheumatism Association (7) is shown in table 2.

TABLE 2. Functional capacity of 16 patients

Class	Functional capacity
I	Complete; capable of usual activities
II	Adequate for normal activities of daily life
III	Limited, capable of light or non-strenuous work
IV	Largely or wholly incapacitated, in need of self-care

### METHODS

The study was designed as a "double-blind" technique described by Greiner et al. (8) necessitated by a study of this type. The patients were divided into two groups and "pairing" of the patients was attempted insofar as possible. Nine patients received a total of 100 mg of pregnenolone in three equal meals and 200 mg at bedtime. Seven patients received an inert placebo consisting of lactose gelatin capsules in a dosage schedule the same as that of the pregnenolone. The placebo was indistinguishable from the agent tested and was not identifiable to the patient, physicians, or ward attendants, the drug being kept by the pharmacist who prepared the ward drug issues.

The patients were placed on a regular hospital diet. Moderate activity about the hospital was encouraged. No therapy except simple physiotherapy and analgesics was given in addition to the test agents. The study included a therapy period of 56 days. Several patients dropped out of the study and several were added after the project was under way so that all patients did not receive 56 days of the agent or placebo.

The daily report-card technique described by Greiner et al. (8), with modification, was used as a continuous subjective estimate of clinical effect. These data were analyzed weekly and cumulatively. Clinical evaluation of the patients was made prior to, during, and following therapy. For this evaluation the physicians had at hand,

(7) Steinbrocker, O., Traeger, C. H., and Batterman, R. C. Therapeutic criteria for rheumatoid arthritis. *J. A. M. A.* 140: 659-662, Jun. 25, 1949.

(8) Greiner, T.; Gold, H.; Carr, H. M.; Travell, J. B.; Bak, L. H.; Rinzler, S. H.; Benjamins, Z. H.; Warshaw, L. J.; Bobb, A. L.; Kivitt, N. T.; Modell, W.; Rothhead, H. H.; Messeloff, C. R.; and Kramer, M. L. Method for evaluation of effects of drug on cardiac pain in patients with angina pectoris: study of chloral hydrate. *Am. J. Med.* 9: 143-153, Aug. 1950.

combined with other steroids, including testosterone progesterone desoxycort cortisone and estradiol. In 73 percent of this group complete remission or major improvement was reported. The results obtained by these authors were considered to be similar though less spectacular to those obtained with cortisone and ACTH and without their untoward side effects. Smith (6) reported the results of the oral or intramuscular administration of pregnenolone to 93 patients with rheumatoid arthritis and concluded that pregnenolone is of relatively little value in the treatment of rheumatoid arthritis. No important side effects have been reported following the use of pregnenolone.

This report concerns clinical observation on 16 patients hospitalized with rheumatoid arthritis and spondylarthritis 7 of whom are used as placebo controls in a double blind type of clinical experiment. We are not aware of previous reports of controlled observation of the clinical effects of pregnenolone in rheumatoid arthritis.

TABLE I. General features of patients included in this study

Group	Case	Age	Duration of disease	Functional capacity	Days of treatment
A	1	41	12 yr.	I	56
	2	20	11 mo.	II	24
	3	34	5 yr.	II	56
	4	19	2 mo.	II	42
	5	19	7 mo.	II	21
	6	32	4 yr.	II	14
	7	22	1 yr.	II	56
	8	22	1 yr. 7 mo.	III	35
	9	54	1 yr. 6 mo.	IV	56
B	10	26	2 yr.	I	56
	11	31	7 yr.	II	56
	12	22	3 mo.	II	28
	13	22	8 mo.	III	56
	14	21	9 mo.	III	56
	15	62	5 yr.	III	56
	16	59	70 yr.	IV	56

\*See table 2.

T. treated with pregnenolone.

Treated with placebo.

## MATERIAL

The 16 patients included in this study were male naval personnel or veterans with rheumatoid spondylarthritis or rheumatoid arthritis. Ages, duration of disease, functional capacity, days of treatment with the agent or placebo are given in table I. The age of the patients ranged from 19 to 62 years and the duration of the disease was from

(6) Smith, P. T. Testosterone, pregnenolone and related steroids in treatment. Philadelphia Med. 45: 1271, Apr. 8, 1950.

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TABLE 2. Functional capacity of 16 patients with arthritis

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(8) Greiner, T.; Gold, H.; Castell, M.; Travell, J.; Baker, H.; Rinzler, S. H.; Benjamin, Z. H.; Warshaw, L. J.; Bobb, A. L.; Kivitz, N. T.; Modell, W.; Rothendler, H. H.; Messel, H. C. R.; and Kramer, M. L.: Method for evaluation of effects of drugs on cardiac pain in patients with angina of effort. Study of 100 patients. *Am. J. Med.* 9: 143-155, Aug. 1950.

Some practice is necessary both in making and in reading the new Results will be disappointing if the positioning is not exact. The rays must be properly centered to the midcervical spine and traverse it at right angles. If the patient is not rotated enough overlapping of the two sides will thwart examination; if rotated too far the alignment and disk space will not be accurately shown and the neural arch and facet on one side will be lost behind the vertebral body. A fairly heavy exposure is necessary. In viewing the illusion of depth may be enhanced by reversing the films.



*Figure 1 Patient in proper position for moving cervical plate*

This technic is applied to all patients with chronic neck symptoms and to those with acute conditions in whom the cervical spine is considered stable. In traumatic cases a preliminary lateral scout film is made without moving the patient on the litter. If dislocation or unstable fracture is demonstrated, or if there are neurologic signs, Crutchfield tongs are placed in the skull and straight cervical traction of 6 pounds is begun. Our examination is then made in the horizontal position.

For complete evaluation the routine study is frequently supplemented by additional films. We have found 3 views to be practical help in recognizing defects not demonstrated on the ordinary examination.

1. Anteroposterior, pen-mouth view of the first and second cervical vertebrae. This method also establishes the stability of the spine has been



Figure 2. Roentgenogram taken using recommended technique.

assured. The odontoid process and atlanto-axial articulations should not be neglected in any traumatic case.

2. *True lateral view of the cervical spine in flexion and extension.* This is taken in patients with old injury or neck complaints of some duration, as well as the acutely injured patient having neck complaints but no roentgenographic findings on other films. It allows detection of subluxations not shown in the erect position.



3. *Forty-five degree posterior oblique views* These provide the best visualization of the neural foramina and are made bilaterally when clinical or radiographic findings point to the possibility of nerve root involvement.

The usual anteroposterior view of the cervical spine has seldom been of value in traumatic case. It is occasionally of assistance in rotary dislocations in revealing defects of the transverse processes and in patients with suspected spinal cord neoplasm.

### SUMMARY

Routine anteroposterior and lateral radiographic study of the cervical spine is inadequate. Following injury prompt and complete evaluation is essential if satisfactory results are to be obtained.

### BOOK REVIEW

*Prothrombin Deficiency* by R. Emery Bugg, M. D., Department of Pathology, Radcliffe Infirmary, Oxford. Publication Number 121 American Lecture Series. Monograph in American Lecture in Hematology 83 pages. Charles C Thomas, Publisher, Springfield, Ill., 1951. Price \$2.50.

This book begins with a complete review of the older theories of coagulation with a chronologic development of the more recent ones which include accelerator and factor V. The development of the theories is accompanied by a complete bibliography. Furthermore the author goes into detail on methods of performing and interpreting the one- and two-stage determinations of prothrombin time. He discusses the use of various thromboplastic preparations including the use of Russell's viper venom with lecithin. The last part of the book deals with the application of one- or two-stage prothrombin techniques to dicoumarin therapy and to clinical investigation of hypoprothrombinemia. The routine laboratory techniques are placed in the appendix. The complexities of the reactions are adequately demonstrated and the author stresses that the currently used tests do not measure prothrombin as a quantitative chemical entity but empirically measure the prothrombin effect. The book is concise to the point and summarizes the problems encountered in the diagnosis of prothrombin deficiency. It expounds on the uses and limitations of the tests now available. This volume should be a valuable reference for both the clinical pathologist and the internist.—Lt. Col. A. S. Blum, MC, U. S. A.

# Primary Split-Skin Graft in the Treatment of Pilonidal Cysts

Ellwood V. Boger *Commander MC, U. S. N.* (1)

Edward W. Pakham Jr. *Commander MC, U. S. N.* (1)

**P**ILONIDAL cyst or sinus has been known as an entity for more than 100 years. These embryonal vestigia have fomented much disagreement as to the most satisfactory surgical treatment. Inflammation of these cysts or sinuses is primarily a disease of young adults and thus it becomes one of the more common surgical entities seen in service personnel. The treatment of the acutely inflamed cyst is not complicated, but the problem that is presented to medical officers in subsequent surgical handling has always been more difficult.

It is the policy in naval hospitals to retain active service personnel on the sick list until they are fit to perform all the duties of their rate ashore or afloat and it is the strict interpretation of this phrase that tends to encourage the long postoperative coalescence following block excision of a pilonidal cyst. Holman (2) has stated that in a 2-year period 359 209 sick days were lost by naval personnel because of this disorder. Korb (3) reporting U. S. Navy statistics for 1948 noted 84 682 days lost from duty because of this malady. This study therefore was undertaken to determine whether the application of a split-skin graft at the time of excision would adequately treat the condition and shorten hospitalization. The use of a split-skin graft was decided on because it seemed to be a procedure as simple as that of block excision and would not appreciably increase the operating time nor the demands on the skill of the surgeon.

The first step in the operative procedure consists of passing a groove director into the sinus tract and incising the skin over it. This exposes

(1) U. S. Naval Hospital, Philadelphia, Pa.

(2) Holman, E.: Pilonidal sinus—treatment by primary closure. *Surg., Gynec. & Obst.* 83: 94-100 July 1946. Quoted by Cori, G. H. in Ciba Symposium February 1950.

(3) Korb, J. H.: Infected pilonidal cysts, simplified method of treatment. *Mil. Surgeon* 108: 29-34, Jan. 1951.

the cavity of the sinus so that it may be probed for extensions. After complete delineation of the diseased tissue the tract and skin edges are seized with Allis forceps and, by sharp dissection through uninvolved tissue, the specimen is excised down to the presacral fascia. When hemostasis has been achieved, a split-skin graft of sufficient size to cover the defect caused by the excision is obtained from the adjacent gluteal region and placed over the defect. A vaseline-gauze layer is applied over the graft and pressure exerted by a mechanical waste dressing. For the first 2 postoperative days the patient is allowed only a liquid diet and the prone position is maintained for 5 postoperative days. Careful observance of these two factors obtained the most adequate immobilization of the wound area, and this factor seemed responsible for the highest percentage of graft take. On the fifth postoperative day the dressing is changed. The patient is given sitz baths three times a day to remove the usual skin debris. These baths are continued until the wound is clean and dry. The length of time that the baths were required varied directly with the percentage of graft take.

## RESULTS

The records of 38 patients on active duty recently operated on here for pilonidal cyst have been reviewed as a control group. The group was treated by block excision alone. These records were examined for age incidence, size of the specimen, method of healing, and the average duration of postoperative hospitalization. Our grafted group consisted of 25 similar patients. Only in the duration of hospitalization was a very appreciable difference noted. The average postoperative hospital stay in the control series was 56.6 days (range 15 to 152). In the grafted group the average postoperative hospital stay was 28.2 days (range 15 to 106). The patient in the grafted group who had been hospitalized the longest required the removal of a second pilonidal cyst about 20 days after the first had been removed and grafted. On the second occasion a split-thickness skin graft was not applied. The patient in the control series with the longest hospitalization was one who had a large defect following block excision which healed slowly. A secondary split-skin graft would probably have shortened his period of hospitalization.

## DISCUSSION

This preliminary series of 25 cases has demonstrated a simple satisfactory method for treating pilonidal cyst by excision and grafting which shortened the hospital stay of active duty personnel. These results compare favorably with those reported for the Lahey technique: suture and drainage, suture and packing, simple suture and excision and packing (4). The results analyzed by Koostra (5) in series of per-

(4) Brindley, J. L., and Wilson, H. L. Pilonidal cyst and sinus. *Ann. Surg.* 1: 455-463, Sept. 1933.

(5) Koostra, H. P. Pilonidal sinus: a review of literature and report of 1112 cases.

patients treated by excision and packing excision with partial closure excision and closure with later open packing excision with primary closure and excision with primary closure and drainage do not appear to fit the requirements of "fit for all duties of their rate afloat and ashore" because each patient required dressings for at least 26 days after hospitalization. The reports of Brezin (6-7) deal with a variation of the sliding-flap technic by which the pilonidal cyst is excised by sharp dissection from under a full-thickness flap which is then resutured over the defect. The average hospital stay for patients so treated was 13.3 days to which a 14-day furlough was added. This series is particularly comparable to ours because the patients were also active service personnel. The average ineffective period among these patients thus becomes 27.3 days. Ferguson and McCray (8) described a method of excision by sharp dissection with primary closure using through-and-through wire sutures to include the presacral fascia to hold a gauze pack in place over the wound. In 37 of their patients the average time required for healing was 17.4 days. The average time lost from work was 2 days. The technic requires greater skill on the part of the surgeon and a moderate increase in the operating time over that used by us. It cannot be denied however that the healing time reported in this series may offset the criticism offered. Kleiman (9) reported a series of over 500 patients with pilonidal cyst who were treated by block excision with closure by a technic similar to that described by Ferguson and McCray. His results compare favorably with those of Ferguson and McCray but the technic is open to the same objection mentioned in connection with Ferguson's. Korb (3) reported a different technic; 22 patients were treated in a dispensary by delineation and incision of all tracts which were then packed with solid silver nitrate for 30 minutes. The resultant necrotic mass was then removed and a vaseline-gauze dressing applied. Hospitalization was recommended for those with much discomfort or those who desired it. The average hospital stay in this series was 0.72 days. Healing time was 25.4 days. These patients were not, however able to perform all the duties of their rate until complete healing was obtained and required daily treatment.

Our experience suggests that exact skin coverage of the postexcisional defect is essential for rapid healing, convalescence and return to duty. We have used the freehand knife and Brown electrodermatome in our series. The use of the Brown electrodermatome in our hands has proved to be eminently satisfactory from the standpoints of uniformity of the grafts and ease of operation. We wish to point out how-

(6) Brezin, D.: Pilonidal cyst; review of new procedure for operation and treatment. *Am. J. Surg.* 59: 18-24, Jan. 1943.

(7) Brezin, D.; Lo, C. and Lawrence, J.: Pilonidal cyst. *Am. J. Surg.* 60: 264-266, May 1943.

(8) Ferguson, L. K. and McCray, P. M. Jr. Pilonidal cysts; excision and primary suture in ambulatory patients. *Am. J. Surg.* 36: 270-278, Apr. 1937.

(9) Kleiman, A. Pilonidal cyst; comparison of surgical treatments. *Surgery* 28: 831-836, Nov. 1930.

ever that the freehand knife is more generally available and too easy to use so that possession of the electrodermatome is not essential to the use of this technic. Furthermore, the use of skin grafts alleviated postoperative distress noted in the earlier series—pain is directly proportional to the percentage of tissue. None of the cysts we treated were acutely inflamed at the time of operation, but on several occasions frank pus was encountered within the sinus or cyst. These patients recovered without incident or delay in healing.

### CONCLUSIONS

In a preliminary study, primary split-skin grafting of the wound following block excision of pilonidal cyst or sinus reduced the hospital stay of active service personnel by 50 percent. The technic is simple and does not require an appreciable increase in the operating time or skill of the surgeon. It is anticipated that minor variations in technic will be developed which will decrease the hospital stay of such patients still further. No attempt is made at this time to evaluate this procedure from the standpoint of recurrence.

### BOOK REVIEW

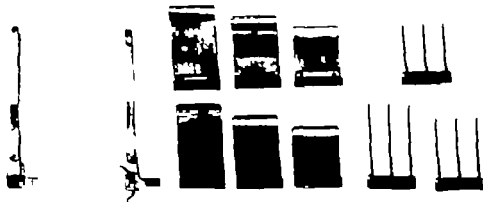
*The Early Diagnosis of the Acute Abdomen*, by Zachary Cape, B. A., M. D., M. S., Lond. F. R. C. S. E. & G. Consultant Surgeon to St. Mary Hospital, Paddington and to the Bolshakov Hospital, Redworth Common, Islington. Professor of Anatomy and Gale and Bradshaw Lecturer, Royal College of Surgeons. 10th edition. 270 pages. Illustrated. Oxford University Press, New York, N. Y. Published 1951. Price \$3.50.

This new edition changed only slightly from the preceding edition which was printed in 1915. The first 3 chapters are devoted to the principles of diagnosis, history taking, and physical examination. The next 15 chapters take up the usual diseases encountered in the abdomen with much space devoted to differential diagnosis. These include obstetric, gynecologic, and urologic diseases, as well as those considered to be general surgical problems. One chapter deals with diseases encountered in the tropics, and the last chapter is devoted to those conditions which may simulate abdominal emergencies. The subject matter is presented as well as simply understood. This is a valuable place in medical literature as a new introduction to the subject of medicine and surgery is a very useful reference with which to refresh the practicing physician's memory. This is a similar presentation should be present in every medical library. The index is simple. There is no bibliography.—Col. W. W. Schol. MC US A.

# A Versatile Spinal Retractor

Joseph W. Batch, Colonel, MC, U. S. A.

**O**PERATIONS on the back require adequate retraction. Because of the variability in the depth of the musculature of backs in different patients and the variety of procedures which may be performed it is highly desirable that a retractor be available which will provide adequate retraction. Because most retractors available to me did not possess the desired features I thought it advisable to construct a retractor which could be used for almost any type of operative procedure and in most backs from those that are very thin to those that are thick and muscular.



*Figure 1 Spinal retractor showing frame, three pairs of blade plates, and three pronged blades.*

A stainless steel retractor which consists of a basic frame with one rigid arm and a movable arm on a traversing rod was made. The free arm is moved by a pinion gear with a winged thumb handle. The position of this arm is fixed by a winged screw on the geared traversing rod (fig. 1). Three pairs of plain blades were made in graduated sizes for various thicknesses of the back. These blades slide one over each arm and lock in place by means of a pin in a spring clip on top of each arm the pin passing into a hole drilled on top of each blade. The blades may be used as a pair for retraction on both sides of the spinous processes (fig. 2).

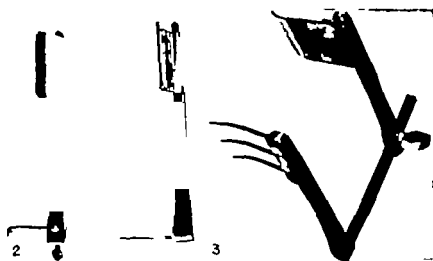


Figure 2. Spinal retractor showing underside with one pair of blade attached. Figure 3. Spinal retractor showing pronged and blade plates attached.

For unilateral exposure and retraction one blade may be used with a three-pronged blade which pierces the musculature on the side opposite the exposure. A three-pronged blade was made for each size of blade plate. Two holes were drilled in the top of each pronged blade for locking so that it could be reversed and used on either arm (fig. 3).

A small metal box was constructed in which to keep the nine blades. This retractor is reported because I have used it for the past 2 years and found it a most valuable and versatile retractor in back surgery having features not found in the generally available spinal retractors.

# Instrumental Perforation of Uterus<sup>(1)</sup>

John T. Parente *Lieutenant, Junior Grade MC, U. S. N. R.*

Albert L. May *Lieutenant Commander MC, U. S. N.*

A. Galvez, M. D.

UTERINE perforation by instrumentation of a pregnant uterus has been regarded by many authors as the most serious accident relating to the procedure of abortion. A careful positive diagnosis of such a condition is imperative. When a positive diagnosis is made laparotomy is indicated to determine the extent of the damage and correct it. The surgical correction depends essentially on the findings with proper consideration of the total socio-biologic status of the patient. The following case report represents an accident resulting from an abortion. The uterine perforation was complicated by herniation of the omentum through the tear. A remarkable feature was the lack of any signs, symptoms or discomfort resulting from and following the accident.

## CASE REPORT

On 8 April 1951 a 28-year-old Filipina mother of 4 children had a dilatation and curettage performed on herself to abort her fifth pregnancy. The procedure was performed by a local physician in his office. The patient was given something in her arm for anesthesia, and recalls nothing of the operation. She received an injection of penicillin postoperatively and was discharged the following day with advice to go to a hospital for examination but she felt so well that she remained at home carrying out her usual household routine for 3 days prior to visiting the local hospital. She came to the hospital on 12 April only at the insistence of her husband, who was concerned over the note given her by the abortionist, which stated that he had performed a dilatation and curettage and that he might have perforated the uterus.

The patient stated that her last menstrual period started on 7 January and was normal. She had had 4 full term spontaneous deliveries all at home with the aid of a midwife. The last delivery occurred on 5 De-

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(1) U. S. Naval Reservation Hospital, Subic Bay, Luzon, P. I.



ember 1950. On physical examination she was afebrile. There was slight tenderness over the suprapubic area to deep palpation. Pelvic examination revealed a small amount of bright red blood oozing from the cervical os. Some tissue protruded from the cervical os which was soft and the os admitted 1 fingertip. The uterus and adnexa could not be well defined.

The red blood cell count was 4.3 million with 12.5 gm. of hemoglobin. The leukocyte count was 11,250 with 78 percent polymorphonuclear cells, 19 percent lymphocytes and 3 percent monocytes.



Figure 1 Uterine fundus showing ovarian perforation.

lating through per-

On 13 April some of the tissue was examined for examination. The by inches. Microscopic examination of infected placental and decidua performed. A portion of ovarian fundus with herniation through adhesion were released the uterus and a supracervical hysterectomy and a successful second postoperative day.

The cervix was dilated with a 4" dilator and a periotomy was made to the uterine fundus 2 cm. The fundus was removed and separated. The fundus was 15 cm. in length.

# Unusual Corneal Foreign Body

William R. True Lieutenant, MC, U. S. N (1)

ON 19 June 1951 a 22 year-old man was awakened by sharp stabbing pains in the left eye whereupon he discovered a 5-inch long scorpion lying across the eye and temporal area. The arachnid was brushed off and destroyed. The patient's eye became red immediately and throbbed with continuous pain. The eyelids swelled progressively and vision became slightly blurred within 1 hour. Lacrimation and photophobia were marked. Emergency treatment consisted of 50 mg of diphenhydramine hydrochloride given orally q.i.d. warm compresses applied every 2 hours and the instillation of penicillin ophthalmic ointment in the conjunctival sac. Examination of the left eye by an ophthalmologist on 22 June showed the vision to be decreased to a finger count at a distance of 3 feet. ciliary injection, punctate keratitis and iritis. The patient's condition was good except for pain in the eye and drowsiness which was probably induced by the diphenhydramine. He was evacuated to this ship on 23 June for bi-microscopic studies and for further treatment.

The findings on admission were as follows: vision in each eye was 20/80 corrected with glasses to 20/20 OD and 20/40 OS. A pinhole disk did not further improve the vision of the left eye. Mydriasis of the left eye was present. The lids were red and edematous. The bulbar and palpebral portions of the conjunctiva were moderately injected. Slit-lamp microscopy revealed mild edema of the entire cornea. A needlelike shaft about 3 mm long was embedded horizontally deep in the substantia propria of the cornea. A slight reaction was noted about this shaft. There was no staining with fluorescein. Several minute punctate lesions were seen on the epithelial surface of the cornea. There was a slight flare in the anterior chamber but no cells were noted. The iris, vitreous and fundus were normal. The foreign body was invisible to the naked eye.

(1) U. S. S. *Haven*

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The red blood cell count was 4.3 million with 12.5 gm of hemoglobin. The leukocyte count was 11,250 with 78 percent polymorphonuclear cells, 19 percent lymphocytes and 3 percent monocytes.



Figure 1 Uterine fundus bearing omentum tissue herniating through perforation.

On 13 April some of the tissue protruding from the cervix was obtained for examination. The hysterometer reading at this time was 4½ inches. Macroscopic examination of tissue revealed omental tissue and infected placental and decidua. On 27 April a laparotomy was performed. A portion of omentum was found to be adherent to the uterine fundus with herniation through a defect measuring 2.5 by 2 cm. The adhesions were released, the herniated omentum was ligated and separated, and a supracervical hysterectomy was performed (fig. 1). The patient made an uneventful recovery and was discharged on the eighth postoperative day.

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*Figure 1. Uterine fundus showing omental hernia herniating through perforation.*

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Under 0.5 percent procaine local anesthesia the foreign body was extracted using a small Graefe knife and forceps with the aid of slit lamp visualization. Because of its friability it was removed in 4 separate pieces. The base was cleaned with a small dental burr. The eye was dressed with an ointment containing 0.1 percent aureomycin and 1 percent atropine. Cortisone solution (1:4 dilution) was used topically, 1 drop being instilled into the eye every 2 hours. The antihistaminics were continued. The cornea was completely healed without scarring and the uveitis had resolved within 6 days. Microscopic examination of the foreign body revealed a minute tapering thin shaft without segmentation. This was assumed to be the tail-tip of the scorpion.

## BOOK REVIEW

*Clinical and Roentgenologic Evaluation of the Pelvis in Obstetrics*, by Howard C. Holey, M.D., M.Sc. Assistant Clinical Professor of Obstetric and Gynecology College of Physicians and Surgeons, Columbia University and The Sloane Hospital for Women, 119 pages; Illustrated, America Monograph Series, W. B. Saunders Co., Philadelphia, Pa., published 1951.

This is a brief, well-written practical monograph with excellent illustrations. The progress of pelvimetry and the problems encountered are discussed. Types of pelvis are completely described and classified. The clinical evaluation of pelvis is discussed in an understandable, practical manner. The relation of forceps mechanisms to position and pelvic type is clearly summarized. The author's special stereoscopic technique is described in detail. Throughout the book there are many practical bits of information and statements of generally accepted obstetrical procedure. This monograph which includes bibliography is an attempt by the publisher to present various specialty subjects to the profession inexpensively. It is recommended to the student and the physician interested in obstetrics.

—Col. H. E. Harrison, MC, U. S. A.

## BOOKS RECEIVED

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**The Public Health Nurse and Her Patient**, by *Ruth Gilbert* Coordinator Course for Mental Hygiene Consultants and Assistant Professor of Nursing Education, Teachers College Columbia University 348 pages Published for the Commonwealth Fund by Harvard University Press Cambridge Mass. 1951 Price \$3.75

**Clinical Urography An Atlas and Textbook of Roentgenologic Diagnosis** by *William F. Brunsch* M. D. Emeritus Consultant in Urology Mayo Clinic Emeritus Professor of Urology Mayo Foundation, Graduate School University of Minnesota and *John L. Emmett*, M. D. Consultant in Urology Mayo Clinic Associate Professor of Urology Mayo Foundation Graduate School University of Minnesota. 736 pages; illustrated. W. B. Saunders Co. Philadelphia, Pa. 1951

**Clinical and Roentgenologic Evaluation of the Pelvis in Obstetrics** by *Howard C. Moloy* M. D. M. Sc. Assistant Clinical Professor of Obstetrics and Gynecology College of Physician and Surgeon Columbia University and the Sloane Hospital for Women. 119 pages; illustrated. American Monograph Series W. B. Saunders Co., Philadelphia Pa. publishers 1951

**Decompression Sickness Case on Sickness Diver's and Flier's Head and Related Syndromes** compiled under the auspices of the Subcommittee on Decompression Sickness Committee on Aviation Medicine Division of Medical Sciences National Research Council, Washington D. C. 21 contributors 437 pages; illustrated. W. B. Saunders Co. Philadelphia Pa., publishers 1951

**Simplified Nursing** by *Florence Dakin*, R. N. former Inspector of School of Nursing State of New Jersey and *Ellis M. Thompson*, B. S. R. N. formerly President, National Association for Practical Nurse Education, Member Job Analysis Committee, United States Office of Education Chairman, Production Committee of the Curriculum Committee United States Office of Education formerly Consultant, North Atlantic Area American Red Cross Volunteer Nurse Aide Program 5th edition. 730 pages; 78 illustrations. J. B. Lippincott Co. Philadelphia Pa. publisher 1951

**Diabetes Control** by *Edward L. Bortz*, M. D. Chief of Medical Service B. Th. Lankenau Hospital Associate Professor of Medicine Graduate School of Medicine University of Pennsylvania Philadelphia former President of the American Medical Association. 264 pages; illustrated. Lea & Febiger Philadelphia Pa. publishers 1951 Price \$3.50.

**Grouping, Typing and Banking of Blood** by *Otokar Jaroslav Pollak*, M. D. Ph. D. F. C. A. P. Director Blood Bank; Chief Department of Anatomical Clinical and Experimental Pathology Director School for Medical Technologists Quincy City Hospital Quincy Mass., Consultant Pathologist, Jordan Hospital, Plymouth Mass. 163 pages; illustrated. Charles C. Thomas Publisher Springfield, Ill. 1951 Price \$5.75



Under 0.5 percent pontocaine topical anesthesia the foreign body was extracted using a small Graefe knife and forceps with the aid of slit lamp visualization. Because of its friability it was removed in 4 separate pieces. The base was cleaned with a small dental burr. The eye was dressed with an ointment containing 0.1 percent aureomycin and 1 percent atropine. Cortisone solution (1:4 dilution), was used topically 1 drop being instilled into the eye every 2 hours. The antihistaminics were continued. The cornea was completely healed without scarring and the iritis had resolved within 6 days. Microscopic examination of the foreign body revealed a minute tapering thin shaft without segmentation. This was assumed to be the tail tip of the scorpion.

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**Clinical and Roentgenologic Evaluation of the Pelvis in Obstetrics** by Howard C. Meloy M. D., M. Sc. Assistant Clinical Professor of Obstetrics and Gynecology College of Physicians and Surgeons, Columbia University and The Sloane Hospital for Women. 119 pages illustrated. American Monograph Series. W. B. Saunders Co., Philadelphia, Pa., publishers 1951.

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- Decompression Sickness, Caisson Sickness, Divers and Flier's Heads and Related Syndromes** compiled under the auspices of the Subcommittee on Decompression Sickness Committee on Aviation Medicine Division of Medical Sciences, National Research Council Washington D. C. 21 contributors 437 pages; illustrated W. B. Saunders Co. Philadelphia Pa. published 1951
- Simplified Nursing** by *Florence Dekker*, R. N. former Inspector of Schools of Nursing Staff Nurse; and *Ellen M. Thompson*, B. S. R. N. formerly President, National Association for Practical Nurse Education Member Job Analysis Committee United States Office of Education Chairman, Production Committee of the Curriculum Committee United States Office of Education formerly Consultant North Atlantic Area American Red Cross Volunteer Nurses Aide Program. 5th edition 730 pages, 78 illustrations J. B. Lippincott Co. Philadelphia Pa. published 1951
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**Manual Therapy** by James B. Mann II, M.A., M.D., B.C. (Canada), Consulting Physician, Physical Medicine, St. Thomas Hospital, Vice-President and Hon. Fellow, Chartered Society of Physiotherapy, London, England, Gold Key of the American Congress of Physiotherapy, Gold Key of the American Physical Therapy Association; Honorary Life Member of the Netherlands Physiotherapy Association. 64 pages, illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1951. Price \$2.25.

**Large Scale Research Techniques: A Manual for the Group Research and Multiple Choice Tests** by M. R. Harrow, Ph.D., Research and Consulting Psychologist, New York City, and M. E. Stinner, M.A., Research Psychologist, General Electric Company, Bridgeport, Conn., with Contribution by Floyd O. De Mott, M.D., Assistant Clinical Professor of Psychiatry, University of California Medical School, Berkeley, Calif., Ph.D., Assistant Professor of Psychology, San Francisco State College, and M. Erik Wright, Ph.D., M.D., Professor of Clinical Psychology, Department of Psychiatry, University of Kansas Medical School, Department of Psychology, University of Kansas. 2d edition. 331 pages, 136 illustrations. 87 New. Charles C. Thomas, Publisher, Springfield, Ill., 1951. Price \$9.50.

**Metabolic Method: Clinical Procedure in the Study of Metabolic Functions** by C. Frank Conzelmann, Chief of Biochemistry Unit, First Army Medical Nutrition Laboratory, Chicago, Ill., Robert E. Johnson, M.D., D. Phil. (Oxford), Professor and Head of the Department of Physiology, University of Illinois, Urbana, Ill., and E. Lynn Mark, M.A., Biochemist, United States Army Medical Nutrition Laboratory, Chicago, Ill. 471 pages, illustrated. The C. V. Mosby Co., St. Louis, Mo., publisher, 1951. Price \$6.75.

**Principles and Practice of Obstetric** originally by Joseph B. DeLee, M.D., by J. P. Grubb III, M.D., Attending Obstetrician and Gynecologist, The Michael Reese Hospital, Obstetrician and Gynecologist, Assistant Staff, the Chicago Lying-in Hospital, Attending Gynecologist, Cook County Hospital, Professor of Gynecology, Cook County Graduate School of Medicine, 10th edition. 1,120 pages, 1,140 illustrations. W. B. Saunders Co., Philadelphia, Pa., publisher, 1951.

**Clinical Pediatric Urology** by Meridith Campbell, M.S., M.D., F.A.C.S., Professor of Urology, New York University Post-Graduate Medical School, Visiting Urologist, Bellevue and University Hospitals, New York, with Section on Nephritis and Allied Disorders, Infancy and Childhood by Elvira Goettl, A.B., M.D., Associate Professor of Pediatrics, University of Southern California School of Medicine, and Assistant Medical Director, The Children's Hospital Society of Los Angeles, and John D. Lytle, A.B., M.D., Late Professor of Pediatrics, University of Southern California School of Medicine, and Medical Director, The Children's Hospital Society of Los Angeles. 1,113 pages, illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher, 1951.

**Clinical Hematology** by Maxwell M. Wirobe, M.D., Ph.D., Professor of Medicine and Director, Laboratory for the Study of Hereditary and Metabolic Disorders, University of Utah College of Medicine, Salt Lake City, Utah, formerly Associate in Medicine, Johns Hopkins University, Assistant Physician, Johns Hopkins Hospital, and Physiochemist, the Clinical Nutrition Laboratory, Gastrointestinal and Hemopoietic Disorders, Baltimore, Md. 3d edition, thoroughly revised. 1,048 pages, 220 illustrations and 17 plates. 13 in. by 9 in. by 1 in. L. A. Fisher, Philadelphia, Pa., publisher, 1951. Price \$12.50.

**Tobacco and the Cardiovascular System, the Effects of Smoking and of Nicotine on Normal Persons** by *Grace M Roth* Ph.D., Associate Professor of Experimental Medicine Mayo Foundation for Medical Education and Research Graduate School University of Minnesota and Consultant in Section on Physiology Mayo Clinic Rochester Minn. Publication Number 100 American Lecture Series A Monograph in American Lectures in Circulation Edited by *Irvine H Page* M.D. Cleveland Clinic Cleveland Ohio and *A. C. Corcoran* M.D. Cleveland Clinic Cleveland Ohio 66 pages illustrated. Charles C Thomas Publisher Springfield Ill. 1951 Price \$2.25

**Frontal Lobotomy and Affective Behavior a Neurophysiological Analysis** by *John F Fulton*, M.D. Sterling Professor of Physiology Yale University 159 pages illustrated W W Norton & Co Inc. New York, N.Y. publisher 1951 Price \$3

**Progress in Neurology and Psychiatry An Annual Review Volume VI** edited by *E. A. Spiegel* M.D. Professor and Head of the Department of Experimental Neurology Temple University School of Medicine Philadelphia Pa. 362 pages Grune & Stratton New York N.Y. publisher 1951 Price \$10.

**Primary Anatomy** by *H. A. Cate* M.B. Professor of Anatomy and Director of the School of Physical and Health Education University of Toronto 2d edition 344 pages illustrated The Williams & Wilkins Co. Baltimore Md., publisher 1951

**Röntgen Anatomy (Röntgen Anatomia)** by *David Steil* M.D. St. John's Hospital, Evangelical Deaconess Hospital, Cleveland Ohio 108 full page plates Charles C Thomas Publisher Springfield Ill., 1951 Price \$8.

**Causalgia**, by *Frank H Mayfield*, M.D. Assistant Professor of Clinical Surgery College of Medicine University of Cincinnati Attending Neurological Surgeon, Bethesda Hospital Christ Hospital, Deaconess Hospital, Good Samaritan Hospital St. Francis Hospital and Jewish Hospital Cincinnati, Ohio Publication Number 58 American Lecture Series. A Monograph in American Lecture in Neurosurgery Edited by *Michael E. D. Bailey* M.D. Professor of Surgery and Head of the Department of Surgery Baylor University College of Medicine Houston Tex. and *R. Glom Sparling*, M.D. Clinical Professor of Surgery University of Louisville Louisville Ky. Neurosurgical Division edited by *Barnes Woodhall* M.D. Professor of Neurosurgery Duke Hospital and School of Medicine Durham N.C. 65 pages illustrated. Charles C Thomas Publisher Springfield, Ill. 1951 Price \$2.25

**Anemiothesia** by *Lawrence M. Randall*, M.D. Section on Obstetrics and Gynecology Mayo Clinic and *Thomas W. McEllin* M.D. Fellow in Obstetrics and Gynecology Mayo Foundation, Rochester Minn. Publication Number 109 American Lecture Series A Monograph in American Lectures in Endocrinology Edited by *Willard O. Thomson* M.D. Clinical Professor of Medicine University of Illinois College of Medicine Managing Editor Journal of Clinical Endocrinology Chicago Ill. 74 pages Charles C Thomas Publisher Springfield, Ill. 1951 Price \$2.25

**Cunningham's Text Book of Anatomy** edited by *James Cosper Braash* M.C. M.A. M.D. D.Sc. F.R.C.S. Ed. F.R.S.E. Professor of Anatomy University of Edinburgh. 9th edition 1,604 pages illustrated by 1,252 text figures 699 of which are printed in colours and 88 plates including 145 radiographs. Oxford University Press New York N.Y., publisher 1951 Price \$14.

**Manual Therapy** by James B. Mason II, M.A., M.D., B.C. (Canada), Consulting Physician in Physical Medicine, St. Thomas Hospital, Viceroy and Baron F. How, Chartered Society of Physiotherapy, London, England. Gold Key of the American Congress of Physical Medicine. Gold Key of the American Physical Therapy Association. Honorary Life Member of the Netherlands Physical Therapy Association. 64 page illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1951. Price \$2.25.

**Large Scale Rorschach Technique** A Manual for the Group Rorschach and Multiple Choice Tests by M. R. Horowitz, Ph.D., Research and Consulting Psychologist, New York City and W. E. Steiner, M.A., Research Psychologist, General Electric Company, Bridgeport, Conn., with Contribution by Floyd G. Du, M.D., Assistant Clinical Professor of Psychiatry, University of California Medical School, Beverly Hills, Ph.D., Assistant Professor of Psychology, San Francisco State College and M. Erik Wright, Ph.D., M.D., Professor of Clinical Psychology Department of Psychology, University of Kansas. Medical School Department of Psychology, University of Kansas. 2d edition, 331 pages, 136 illustrations, 87 tables. Charles C. Thomas, Publisher, Springfield, Ill., 1951. Price \$8.50.

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**Principle and Practice of Obstetrics** originally by Joseph B. DeLee, M.D., by J. P. Grubbill, M.D., Attending Obstetrician and Gynecologist, The Michael Reese Hospital, Obstetrician and Gynecologist, Associate Staff, the Chicago Lying-in Hospital, Attending Gynecologist, Cook County Hospital, Professor of Gynecology, Cook County Graduate School of Medicine, 10th edition, 1,120 pages, 1,140 illustrations. W. B. Saunders Co., Philadelphia, Pa., publisher, 1951.

**Clinical Pediatric Urology** by Merrick Campbell, M.S., M.D., F.A.C.S., Professor of Urology, New York University Post-Graduate Medical School, Visiting Urologist, Bellevue and University Hospital, New York, with Section on Nephritis and Allied Disease in Infancy and Childhood by Elton Gossick, A.B., M.D., Associate Professor of Pediatrics, University of Southern California School of Medicine, and Assistant Medical Director of the Children's Hospital Society of Los Angeles, and John D. Lyttel, A.B., M.D., Late Professor of Pediatrics, University of Southern California School of Medicine, and Medical Director of the Children's Hospital Society of Los Angeles. 1,113 pages, illustrated. W. B. Saunders Co., Philadelphia, Pa. publishers, 1951.

**Clinical Hematology** by Maxwell M. Wintrobe, M.D., Ph.D., Professor of Medicine and Director, Laboratory for the Study of Hereditary and Metabolic Disorders, University of Utah College of Medicine, Salt Lake City, Utah, formerly Associate in Medicine, Johns Hopkins University, A senior Physician, Johns Hopkins Hospital and Physiological Research Clinic for Hereditary Gastrointestinal and Hemopoietic Disorders, Baltimore, Md. 3d edition thoroughly revised, 1,048 pages, 220 illustrations and 17 plates, 13 in color. Lea & Febiger, Philadelphia, Pa. publisher, 1951. Price \$12.50.



Proceedings of the Third International Congress of the International Society of Hematology Cambridge England August 21-25 1950. Editorial Committee Carl J. Moore U.S.A. Editor-in-Chief L. Derman, U.S.A. J. Bernard, France; S. Haberman, U.S.A.; J. Hill, U.S.A. H. Lada, Switzerland R. MacFarland U.K. S. Mottier U.S.A.; R. Rac U.K. and E. Starti, Italy. 593 pages. Illustrated. Grune & Stratton New York N.Y. publisher 1951. Price Cloth bound \$10. Paper bound \$8.

Chronology of Ophthalmic Development: An Outline Summary of the Anatomical and Functional Development of the Visual Mechanism Before and After Birth by Arthur H. Kenney M.D., Wills Eye Hospital Philadelphia Pa. Publication Number 99 American Lecture Series. A Monograph in American Lecture in Surgery. 22 pages. Charles C Thomas Publisher Springfield Ill., 1951. Price \$2.

The Effect of Hormones Upon the Testis and Accessory Sex Organs by Harry J. Heckel, A.B., M.D. Clinical Professor of Urology Department of Surgery University of Illinois College of Medicine. Chairman Department of Urology Presbyterian Hospital; Attending Urologist, Ravenswood Hospital and Henshaw Hospital; Consulting Urologist, Chicago Intensive Treatment Center Chicago Ill. Publication No. 110, American Lecture Series. A Monograph in American Lecture in Endocrinology. 73 pages. Illustrated. Charles C Thomas Publisher Springfield, Ill. 1951. Price \$2.25.

A Color Atlas of Morphologic Hematology with Guide to Clinical Interpretation, by Geneva A. Deland, B.S., Chief Laboratory Assistant in Hematology Thorndik Memorial Laboratory; Research Laboratory Technician Boston City Hospital. Edited by Thomas Hale Ham, M.D. Assistant Professor of Medicine Harvard Medical School. Associate Director Thorndik Memorial Laboratory. Junior Visiting Physician Boston City Hospital. 74 pages. Illustrations by Etta Pletti. From the Second and Fourth (Harvard) Medical Services and the Thorndik Memorial Laboratory Boston City Hospital. Harvard University Press Cambridge Mass. publishers 1951. Price \$5.

Inhalation Anesthesia, A Fundamental Guide by Arthur E. Guedel, M.D. Associate Clinical Professor of Surgery (Emeritus) University of Southern California School of Medicine. 2d edition. 143 pages. The Macmillan Co. New York, N.Y. publisher 1951. Price \$3.75.

Children's Radiographic Technique by Ferris E. Shurtleff R.T., The Children's Medical Center Boston, Mass. 80 pages. Illustrated. Lea & Febiger Philadelphia, Pa. publisher 1951. Price \$3.75.

## BOOK REVIEWS

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**Progress in Neurology and Psychiatry** An Annual Review Volume VI, edited by E. A. Spiegel M. D. Professor and Head of the Department of Experimental Neurology Temple University School of Medicine Philadelphia Pa. 562 pages. Grune & Stratton, New York, N Y publisher 1951 Price \$10

This volume is replete with information concerning the newest developments in the field of psychiatry and neurology which may be of interest not only to general practitioners but also to specialists and research workers. In it the current literature is reviewed. About one third of the book is devoted to clinical neurology; about one-third to clinical psychiatry; about one-sixth to basic sciences and about one sixth to neurosurgery. As the author states "It is hoped that in this way a proper balance corresponding to the actual need of the reader and the amount of published material has been reached particularly since the importance of basic studies in clinical medicine is more and more coming to be recognized and a healthy trend can be noted among progressive psychiatrists trying to liberate this discipline from its isolation and to integrate it into the whole field of medicine. Seventy-two contributors each experts in their respective fields have collaborated in achieving the purpose of the series to develop an up-to-date encyclopedia of neurology and psychiatry. Problems currently debated in the neuropsychiatric literature are adequately if briefly treated. The extensive references at the end of each chapter allow the reader to pursue much more completely the literature dealing with any particular problem. Because no practitioner has the time or background to review or appraise the significant contributions in all branches of neurology and psychiatry this book should be required reading.

—Lt Col. A. L. Brown, MC U S A.

**Surgical Pathology of the Mouth** by E. Wilfred Fildes C. B. E. M. D. Ch. B. L. D. S. (Mench.), D. D. Sc. (Melb.), D. Sc. (Lond.), F. D. S. R. C. S. (Eng.) (From the Meyerstein Laboratory for Dental Research St Mary Hospital Paddington London), Dental Surgeon St Mary's Hospital London, Late Dental Surgeon Royal Dental Hospital London; Hon Research Associate in Physiology University College London External Examiner in Oral Anatomy and Physiology University of Durham Late Examiner in Dental Surgery and Pathology University of Manchester 463 pages; illustrated J. B. Lippincott Co Philadelphia Pa. publisher 1951 Price \$10

In his preface the author states that he does not intend his book to take the place of a text of general pathology nor the more extensive



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The Effect of Hormones Upon the Testis and Accessory Sex Organ, by Harry J. Hecker, A.B., M.D. Clinical Professor of Urology Department of Surgery University of Illinois College of Medicine Chulman Department of Urology Presbyterian Hospital Attending Urologist, Roosevelt Hospital and Hematoma Hospital, Consulting Urologist Chicago Intensive Treatment Center Chicago Ill. Publication No. 110, American Lecture Series A Monograph in American Lecture in Endocrinology 73 pages illustrated Charles C Thomas Publisher Springfield, Ill. 1951 Price \$2.25

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—Lt. Col. A. L. Brown, MC U.S.A.

*Surgical Pathology of the Mouth* by E. Wilfred Fyfe C.B.E. M.D. Ch.B. L.D.S. (Mench.), D.D.Sc. (Melb.), D.Sc. (Lond.), F.D.S. R.C.S. (Eng.) (From the Meyerstein Laboratory for Dental Research, St. Mary's Hospital, Paddington, London), Dental Surgeon St. Mary's Hospital, London, Late Dental Surgeon Royal Dental Hospital, London. Hon. Research Associate in Physiology, University College, London. External Examiner in Oral Anatomy and Physiology, University of Durham, Late Examiner in Dental Surgery and Pathology, University of Manchester. 463 pages; illustrated. J. B. Lippincott Co. Philadelphia, Pa. publisher 1951 Price \$10

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This monograph fulfills a great need for the laboratory and research worker by placing in a readily available and crystal-clear form the methods employed in the study and determinations of the metabolism of mammals whether they are experimental animals or the ill human patient. The variability of the material makes it a time saver. The form of presentation of the material makes the book an ideal manual for teaching and for study. The shelf of every clinical laboratory and research department should contain this book.

—Commander H. A. Lyons MC U. S. A.

**Disease of the Endocrine Glands** by Louis J. Soffer, M. D., F. A. C. P., Asst. Attending Physician and Head of the Endocrine Research Laboratory and Clinic, The Mount Sinai Hospital, New York City; Assistant Clinical Professor of Medicine, Columbia University. 142 pages, 88 illustration and 3 colored plates. Lea & Febiger Philadelphia, Pa. publishers, 1951. Price \$15.

The field of endocrinology has progressively developed and extended and Dr. Soffer has written this book to include these latest developments. He has taken broad view of endocrinology because of the increased evidence that the endocrine glands play a fundamental role in all physiologic processes. His treatment of physiologic and clinical topics is thorough. The syndromes of diseases of the endocrine glands are clearly described. In spite of its general excellence there are a few deficiencies in the book. For example in the discussion of pheochromocytoma there is no mention of norepinephrine except to state that recently it has been demonstrated to be present in these tumors, and again, no mention is made of the organic brain lesions that may result from hypoglycemia. The section on the adrenals is superb. It bears the mark of the author's previous excellent monograph on the adrenal glands. Dr. Soffer has wisely gotten the assistance of Dr. Dolger who has written the section on diabetes mellitus and of Dr. Schval, who has prepared the section on the gonads. Both coauthors have done their jobs well. This book is recommended for both the student and the endocrinologist.—Commander H. A. Lyons MC U. S. A.

**Anesthesia in General Practice** by Stuart C. Cullen, M. D., Head of Division of Anesthesiology Department of Surgery, State University of Iowa Hospitals; Professor of Surgery (Anesthesiology), State University of Iowa College of Medicine. 3d edition. 292 pages. Illustrations. The Year Book Publishers, Inc., Chicago, Ill., publisher. 1951. Price \$4.50.

This book has been revised and improved. It is a collection of the lectures he has given to the medical student at the University of Iowa. It emphasizes the thesis that anesthesia cannot and should not be taught by cook book methods. In support of this the author does not give any unnecessary technical detail but states only that this technical exactness then goes on to how this relates to importance in the patient. Logical and I believe that still more detail and discussion on some of the more controversial points would strengthen

the work especially for the part-time anesthetist. This is an excellent reference manual for students and especially the part-time anesthetist who needs occasional "brushing up" on some particular method or drug. The illustrative cartoons are excellent and complement the text for the student by emphasizing the point being discussed in a way that is pleasant and still forceful. The format of the book is good and it is easily read.—*Waj D E MacQuigg, MC, U S A.*

*A Textbook of Pathology. Pathologic Anatomy in Relation to the Causes, Pathogenesis and Clinical Manifestations of Disease by Robert Allan Moore. Edward Mallinckrodt Professor of Pathology, Washington University School of Medicine, St. Louis, Mo. 2d edition. 1048 pages; illustrated. The W B Saunders Co. Philadelphia, Pa. publishers, 1951.*

The first edition of this text published in 1945 won rapid acceptance as a standard American work on pathologic anatomy. The publisher's decision to reset the type has provided the author with an opportunity for revision of which he has taken full advantage. As indicated in the preface to this edition, the major changes include addition of new chapters to round out the subject matter; subdivision of longer chapters; rearrangement of chapters to improve correlation or to conform to changing concepts; addition of sections on topics omitted from the first edition including some whose importance has been augmented in the interim; relocation of sections because of new information and revision of subject matter because of new or changing information. There are now chapters on diffuse collagen diseases, demyelinating encephalides and disturbances on enzyme metabolism among others. The material on renal disease formerly scattered, has been brought together. Several topics including infectious hepatitis have been grouped in the section on viral disease.

The book has become easier to handle in this edition. Increased page size has made possible a less bulky volume and the adoption of the two-column format makes for easier reading. The binding is good, the typography is clear and the frequent subheads are helpful in a reference work. Many of the illustrations are credited to the Armed Forces Institute of Pathology. Of the colored illustrations, the majority portray clinical subjects or gross lesions. Most are in color. There are a number of maps portraying the geographic distribution of infectious diseases. The references following each chapter are numerous though not exhaustive.

That this work is oriented to the needs of the undergraduate medical student is apparent from the reprinted author's preface to the first edition. Less immediately obvious is its value to the medical officer seeking to familiarize himself with the structural changes underlying the more recently delineated entities or to keep abreast of developments in this basic field. As the subtitle indicates, the object has been to relate morphologic pathology to the living patient, and in this the author would appear to have succeeded admirably. Of outstanding value

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been used. The papers are each devoted to a particular aspect of the clinical, biochemical or physiologic effect of ACTH, in either the normal human being or in different disease states and are prepared by advanced research workers or seasoned clinicians, who have had wide experience with ACTH. Each paper represents the most recent work in its particular subject. Each topic is enlivened and made critical by a discussion, which follows the article. Illustrative charts are again displayed throughout the books. The editor has maintained a high standard in the volumes and has wisely restricted Volume I to the more fundamental aspects of ACTH and adrenal cortical function, as well as to the effects of adrenal corticoids on the different tissues under varied conditions of metabolism and physiologic state in both normal and diseased persons. Volume II is primarily concerned with the effects of ACTH in the treatment of different disease syndromes. Both volumes, however, still deal with fundamental considerations.

This book presents the effects of ACTH on all disease conditions in which the drug has been tried. There are discussions of malignancy, hypothyroidism, myasthenia gravis, ocular diseases, burns, mycotic infections, granulomatous inflammations, the arthritides, endocrine dysfunctions, protozoal diseases and hepatic disease; this list merely scratches the surface of the content of the text.

No practitioner of medicine should fail to read both of these volumes because to do so would be to miss an able presentation of the latest knowledge about one of the great medical discoveries of all time. ACTH.—Commander H. A. Lyons MC U S N

*Atlas der pathologischen Anatomie* by Robert Roessle M. D. Emeritus Professor of Pathology University of Berlin and former Director of the Pathological Institut of the Charity Hospital Berlin, and Kurt Apitz, M. D. one-time Professor and Prosecutor of the Charity Hospital, Berlin. 298 pages with 564 illustrations, mostly in color. Georg Thieme Stuttgart publisher, 1951. Price about \$21.

The foreword explains that preparation of the Atlas was by invitation of the publishers more than 10 years ago. At the beginning, Kurt Apitz was most active in the work but he died in February 1945 before the work was completed and many of the original illustrations were lost during the war. Roessle emphasizes the fact that this is an atlas of special or systematic pathology the illustrations being the main feature and the text used to explain and amplify the pictures. The picture predominates. "It is for the use of students, advanced students and pathologists who have access to a limited number of autopsies."

With characteristic modesty Roessle explains that the illustrations are such as can be collected in a large clinic and such as he has used in demonstration courses. They are all in the gross without any photomicrographs. There are only a few black and white photographs. In some instances explanatory diagrams (prepared by Mrs. Apitz) accom-

in this regard are the paragraphs on clinicopathologic correlation which are included in the sections on most of the diseases described. The pathologist will find the book valuable as a refresher and as ready source of reference to some of the more recent literature. It deals carefully and authoritatively with the major disease entities, and at appropriate length with others.—*Maj J. B. Hartley MC U. S. A.*

**The Bender-Gesalt Test, Quantification and Validity for Adults**, by *Gerrit R. Pincus, Ph. D.*, Research Psychologist, Veterans Psychiatric Institute and Clinic; *Associ. Prof. of Psychology University of Pittsburgh*, and *Barbara J. Suttell, M. S.*, Associate Research Psychologist, Veterans Psychiatric Institute and Clinic. Foreword by *David G. Wright, M. D.* 274 pages; illustrated. Grune & Stratton, New York, N. Y. publisher, 1951. Price \$6.50.

The Bender-Gesalt test consists of 9 sample designs each of which is presented to a subject for him to copy on a piece of paper. This book presents a systematic method for quantitative scoring of the test and the results obtained by applying the method to the test records of normal adults (nonpatients) and adults with psychogenic disorders. Part I is a report and discussion of the research studies made by the authors in their investigation of the reliability and validity of the scoring method and the establishment of standards. Part II combines the quantitative and the qualitative approaches to the interpretation of the test as applied to the individual subject. Part III which takes up most of the volume is a scoring manual carefully detailed and well illustrated with an atlas of scored tests records on which the clinician unfamiliar with the author's procedures can check his understanding of them. This book is highly specific and technical in its subject matter and unlikely to be of interest to anyone except those working in the field of clinical psychology. The volume does present in an orderly and careful fashion a new method for evaluating a test which is widely used. The authors present not only a systematic method of carrying out, but integrate their findings with those of others who have used this test experimentally. Furthermore they indicate the limitations of the test and on the other hand make some stimulating interpretations and hypotheses as to its qualitative meanings. This is a meticulous, excellent and sound work in the admittedly limited and specific area which it purports to cover.

—*Command S. V. Thompson, MC, U. S. A.*

**Proceedings of The Second Clinical ACTH Conference** Volume I Research and Volume II Therapeutic edited by *John R. Moulton, M. D.* Volume I 531 pages, illustrated; Volume II 716 pages, illustrated. The Philadelphia Co. Philadelphia, Pa. publishers, 1951. Price each volume \$8.50.

The rapid increase of study made since the publication of the Proceedings of the First Clinical ACTH Conference necessitated the publication of this work in two volumes, one devoted to research and the other to therapeutics. The format of the previous publication has

been used. The papers are each devoted to a particular aspect of the clinical, biochemical or physiologic effect of ACTH in either the normal human being or in different disease states and are prepared by advanced research workers or seasoned clinicians, who have had wide experience with ACTH. Each paper represents the most recent work in its particular subject. Each topic is enlivened and made critical by a discussion, which follows the article. Illustrative charts are again displayed throughout the books. The editor has maintained a high standard in the volumes and has wisely restricted Volume I to the more fundamental aspects of ACTH and adrenal cortical function, as well as to the effects of adrenal corticoids on the different tissues under varied conditions of metabolism and physiologic state in both normal and diseased persons. Volume II is primarily concerned with the effects of ACTH in the treatment of different disease syndromes. Both volumes, however, still deal with fundamental considerations.

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to internists as well as surgeons and radiologists. The discussion and illustrations of the changes in the duodenum following acute pancreatitis are not as convincing as is most of the book. The discussion of meconium ileus is quite illuminating and very well presented. The last chapter is given over to differential diagnosis and is in effect a summary of the entire book. It is quite concise and the check lists given should be valuable to a busy practitioner.

—Lt Col. H C Harrell MC, U S A.

Army Medical Library Classification. Medicine, Preclinical Sciences—QS-QZ, Medicine and Related Subjects—W. 275 pages. For sale by the Superintendent of Documents U S Government Printing Office Washington D C. 1951. Price \$1.25

This book has been long awaited particularly by libraries being organized or by libraries finding it important to reclassify their collections to keep in line with the expanding fields of medicine and the allied sciences. This present system has been in use since a Survey Report on the Army Medical Library published in 1944 recommended that the library be reclassified. Funds for this extensive project were provided by the Rockefeller Foundation. The Classification Committee turned the compilation of the scheme over to Miss Mary Louise Marshall under the direction of representatives from the Survey Committee, the Library of Congress and the Army Medical Library. Miss Marshall's work was done "in close and constant consultation with physicians. In addition all available medical classifications as well as the contents of numerous textbooks in the respective subjects were studied for arrangement and modern ideas as to inclusiveness in the various fields.

This scheme of classification covers the fields of medicine and related sciences. Extensive use is made of certain of the Library of Congress classification schedules for subjects bordering on medicine and nonmedical reference books. This use is sufficiently general to permit each library to determine its own degree of specificity in application.

The notation for serial publications is noteworthy. These publications fall into five categories according to type. A special scheme of numbering within several of these categories makes possible an alphabetical arrangement. Table G makes possible a geographic arrangement of serials (government publications, hospital reports, et cetera) where desirable. Table G is also used where it is important to arrange monographs geographically. Serial publications which are indexes or bibliographies (Cancer Current Literature, Tuberculosis Index, et cetera) are an exception. These are classified as bibliography under the subject covered in the general scheme for monographs.

Main tables for monographic material are broad and follow a natural sequence through preclinical sciences (Q with subdivisions) to medi-

pany the pictures. The illustrations in color are superb with respect to color values, detail, contrast and selection. The experienced pathologist can imagine himself standing at the autopsy table and seeing the specimens exactly as they are freshly removed. I have never seen so many perfect reproductions of originals nor anything so uniformly good.

The text serves well to explain the illustrations and to provide a brief survey of background theory. Indeed it might be used for review purposes in preparation for examinations. Whether it will be translated is not now known, but the pictures are so good an extensive knowledge of German is not necessary to understanding the nature of the lesions. This book can be highly recommended to anyone who has elegance in his library to those who wish to learn about the morphology of disease and to those who wish to review and modernize their knowledge of special pathology. Professional pathologists would welcome it cordially.—H. T. Karsner, M. D.

**Röntgen Manifestations of Pancreatic Disease** by Max H. Herbert Poppel, M. D., F. A. C. R., Associate Professor of Clinical Radiology, New York University Bellevue Medical Center, Associate Roentgenologist, New York City Hospital; Assistant Radiologist, Mount Sinai Hospital; Roentgenologist, Welfare Island Dispensary, New York City; Consultant in Radiology, United States Naval Hospital, St. Albans, Long Island, N. Y.; Attending Consultant in Radiology, United States Veterans Administration Hospital, Bronx, N. Y., Commander (Medical Corps), United States Navy, 389 pages, illustrated, Charles C. Thomas, Publisher, Springfield, Ill., 1951, Price \$10.50.

As pointed out in the preface, this book might well have been titled *Röntgen Examination of the Upper Abdomen*, as that is what it covers. It is well written and the many illustrations are of superior quality. In some places they are more convincing than the text which tends to be repetitive. There is little or no new material presented, but the book is organized in such a way as to be an excellent reference text for roentgenologists.

The first portion of the book is devoted to a general discussion of embryology, anatomy and physiology of the pancreas and other organs of the upper abdomen. Many roentgenologists will take exception to the author's recommendation as to the method of writing reports, but his method does contain a good checklist. There should be no question as to the roentgenologist having full access to history, clinical and laboratory data prior to giving his opinion.

The author's plan for standardization in the nomenclature of cysts of the pancreas is well taken and the classification on the present seems logical. He also points out that in the 70 percent of the cases of carcinoma of the pancreas that metastasize to bone there are both osteolytic and osteoblastic types. His discussion of physiology and pathology of the pancreas is unusually well presented and should be of great interest

to internists as well as surgeons and radiologists. The discussion and illustrations of the changes in the duodenum following acute pancreatitis are not as convincing as is most of the book. The discussion of meconium ileus is quite illuminating and very well presented. The last chapter is given over to differential diagnosis and in effect a summary of the entire book. It is quite concise and the check lists given should be valuable to a busy practitioner.

—Lt. Col. H. C. Harrell MC US A

Army Medical Library Classification Medicine Preclinical Sciences—(5-1)/4  
Medicine and Related Subjects—W 275 pages For sale by the Superintendent of Documents U. S. Government Printing Office, Washington, D. C. 1951. Price \$1.25

This book has been long awaited particularly by libraries better organized or by libraries finding it important to reclassify their collections to keep in line with the expanding fields of medicine and the allied sciences. This present system has been in use since a Survey Report on the Army Medical Library published in 1944 recommended that the library be reclassified. Funds for this extensive project were provided by the Rockefeller Foundation. The Classification Committee turned the compilation of the scheme over to Miss Mary Louise Marshall under the direction of representatives from the Survey Committee, the Library of Congress and the Army Medical Library. Miss Marshall's work was done in close and constant consultation with specialists. In addition all available medical classifications, as well as the contents of numerous textbooks in the respective subjects, were studied for arrangement and modern ideas as to inclusion in the various fields.

This scheme of classification covers the fields of medicine and related sciences. Extensive use is made of certain of the Library of Congress classification schedules for subjects bordering on medicine and nonmedical reference books. This use is sufficiently general to permit each library to determine its own degree of specificity in application.

The notation for serial publications is noteworthy. These publications fall into five categories according to type. A special scheme of numbering within several of these categories makes possible an alphabetical arrangement. Table G makes possible a geographic arrangement of serials (government publications, hospital reports, et cetera) where desirable. Table G is also used where it is important to arrange monographs geographically. Serial publications which are indexes or bibliographies (Cancer Current Literature, Tuberculosis Index, et cetera) are an exception. These are classified as bibliography under the subject covered in the general scheme for monographs.

Main tables for monographic material are broad and follow a natural sequence through preclinical sciences (Q with subdivisions) to medi-

and well written. The text provides a valuable and well-tested source of fundamental material both theoretical and practical for those engaged in the study and use of physical radiation as applied to medicine. The present volume is divided into two parts: (1) the theory and practice of electrical engineering applied to radiologic apparatus and (2) the theory and application of radiation physics with reference to x-ray diagnosis and x- and gamma-ray therapy.

In addition to the physics of x-ray and radium, there is an excellent discussion of the measurement of radioactive emissions, physical aspects of therapeutic and tracing technique, equivalent dose for x-ray and radioactive material, and a section on radiologic protection including applications and problems related to radi isotopes, roentgenography and roentgenoscopy.

The book is intended primarily as a textbook for physicians who are studying radiology as a specialty. The authors assume no knowledge of mathematics and proceed gradually from the most elementary considerations to advanced material. By bridging the gap between little or no knowledge and advanced specialization, this book not only supplies the needs of student radiologists but materially aids the information of practicing radiologists about contemporary physical theories and their applications to radiology. The book serves the additional purpose of providing the radiologic physicist and technologist with essential fundamental information.—Lt Col W. Daur, USC 15A.

*Anatomy in Surgery* by Philip Thorek, M.D., F.A.C.S., F.L.C.S., Assistant Clinical Professor of Surgery (Formerly Assistant Professor and Topograph Anatomist, University of Illinois College of Medicine, Chicago), Diplomate of the American Board of Surgery, Assistant Professor of Topograph Anatomy and Clinical Surgery, Cook County Graduate School of Medicine, and Member of the American Association of Anatomists. Fellow American College of Chest Physicians, Co-Surgeon-in-Chief of the American Hospital Association, Attending Surgeon, Cook County Hospital, Senior Attending Surgeon, Cook County Branch Hospital, 970 p., 8 1/2 x 11 in., 1951, J. B. Lippincott Co., Philadelphia, Pa., published 1951, Price \$22.50.

This book represents the author's experience in many years of teaching anatomy. The material is so arranged that embryologic, practical and surgical considerations are included along with the descriptive anatomy. The author's style is concise and clear. The illustrations are excellent and many are in color and are presented third-dimensional views. This type of illustration is of value to the student as well as to the surgeon. The lymphatic system is clearly and extensively illustrated. This constitutes a real contribution to the subject. The anomalies of the recurrent laryngeal nerve and the variations of the celiac artery of great importance to the surgeon are also clearly depicted. This book is recommended as the surgeon's reference or for a refresher course in anatomy.

—Commander J. G. Stentz, MC, USA.

*Adventure in Mental Health, Psychiatric Social Work with the Armed Forces in World War II. A Symposium by Betty P. Broadhurst, Irving Brodsky, Elwood W. Camp, Almena Dauley, Ethel L. Ginsburg, Irving Greenberg, Frank T. Greiving, Sidney Hechter, Alfred J. Kahn, Henry S. Maas, Daniel E. O'Keefe, Daniel L. Prosser, Myron J. Rockmore, Elizabeth H. Ross, Forrest H. Whitney, and Imogene S. Young. Edited by Henry S. Maas. 334 pages. Columbia University Press, New York, N. Y. publisher 1951. Price \$4.50.*

This symposium deals primarily with the experiences of 16 writers in psychiatric social work during World War II. It records the growth in stature and position of this profession. Each author has contributed an account of his or her problems encountered during this period and a description of how they were solved. One feels throughout the entire book the struggle of this group for recognition and appreciation and shares with the authors the gratification which comes from the attainment of their objective.

Henry S. Maas has done an excellent piece of work in editing this book which will be of interest to psychiatric social workers as a historical account of a significant period of development as well as a fund of information concerning the solution of current problems arising within present-day activity in this field. Although dealing mainly with military aspects of the subject the authors have widened the scope to include civilian potentialities and have somewhat ambitiously projected their horizons into the field of treatment. It was especially gratifying to me to note the emphasis by most authors of the concept of the psychiatric team. Such a team can give the patient the benefit of all disciplines and the tendency toward overemphasis of any one phase is minimized.—Lt Col H. E. Wilkinson MC US A

*The Mechanism of Cell Division, by M. J. Kopal (Conference Chairman) H. W. Beam, A. M. Brue, H. B. Chalkley, R. Chambers, G. H. A. Clow, L. G. Conkle, L. Cornman, M. E. Cornman, A. J. Dalton, J. S. Frenkel, E. B. Harvey, M. Less, R. H. Liu, R. C. MacCardell, D. Marsland, L. Reitz, and A. H. Sparrow. Editor: Kopal. Walter A. Kopal, Associate Editor: B. J. Henegan, Consulting Editor: M. J. Kopal. Taken from Annals of the New York Academy of Science, Vol. 51, Art. 8, page 1, 1954; illustrated. The New York Academy of Sciences, New York, N. Y., publishers, March 23, 1951. Price \$3.50.*

This symposium is another example of the excellent series of symposia sponsored by the New York Academy of Sciences. The contributors are active investigators in the field of cytologic physiology. The following topics are covered in detail: (1) the mechanism of cleavage and differentiation in cells; (2) the role of mitochondria, Golgi bodies, and cytoplasmic inclusions in mitosis; (3) the effect of microtubule and chemical substances such as colchicine, nitrogen mustards, and podophyllin; (4) the effect of ionizing radiation; (5) the relative radiosensitivity of cells to the mitotic cycle; and a theoretical

consideration of ultrastructures involved in cell division. In general the contributors have presented scholarly reviews with clear-cut conclusions on the current status of the problems concerned. The dean of American cytologists, Edwin G. Conklin, contributes a valuable philosophical dissertation on tolerance among scientists and examples illustrating the contributions by pure morphology and pure general physiology. He humorously points out that the so-called artefacts are often normal artefacts and fertile ground for biophysical investigation. The symposium is a desirable reference book for the scientist interested in the mechanics of cell division and the experimental technique thereto, and will aid the clinician in his understanding of the tool with which he fights cancer.

—Commander I. P. Crook, MC, U. S. A.

**Medical Chemistry, Volume I, A Series of Reviews Prepared under the Auspices of the Division of Medical Chemistry of the American Chemical Society.** Editorial Board, C. M. Sutter, Editor-in-Chief, F. F. Blum, Kenneth A. Campbell, Ed. F. Degering, Walter H. Harburg, Peter F. Hoel, I. Maurer, L. Moore, R. G. Roblin, J. Leon A. Scott, and Glenn E. Lilly. A Series of Editors, George W. Anderson, A. C. Blanton, J. Johann, S. Buck, Robert R. Bittner, Thom. P. Carey, C. J. Casilio, Edward J. Fell, and John L. 43 pages, all articles. John Wiley & Sons, Inc., New York, N. Y., publishers, 1951. Price \$1.50.

The chief object of this book is to include in each chapter reference to all the compounds that have been tested for a particular type of pharmacologic activity. This first volume of a series deals with the following sections each written by a researcher active in the particular field discussed: antithyroid compounds and products; antibiotics; benzoxates; local anesthetics; and analgesics. In each section the chemical structure, physiological preparation, and method of test of the classes of drugs under discussion are given. In each section there are comprehensive reference tables together with a wealth of bibliographic references. The volume will be welcomed as a ready reference work, particularly by pharmacologists, chemists, and general student who are engaged in the synthesis and evaluation of new compounds and drugs. —Commander H. C. Dudley, MC, U. S. A.

**Clinical Unipolar Electrocardiography** by Bernard S. Lippman, A. P. M. F. A. Stanton in Medicine, Emory University School of Medicine, Atlanta, Ga., and Edvard M. A. P. M. D., F. A. C. P., Assistant Professor of Clinical Medicine, Washington University School of Medicine, Director of the Section of Cardiology, St. Louis University Medical Center, St. Louis, Mo. Director, Cardiovascular Clinic, Washington University School of Medicine, St. Louis, Mo. The Year Book Publishers, Inc., Chicago, Ill., publisher. 1951. 144 pp. \$5.

This first compact manual is based on once and for all teaching of the author with instruction course. It is really a ten the term long clearly explained and the first step in the treatment by direct treatment and illustrative ECG. The

basic principles of electrophysiology are described and illustrated with utmost simplicity. A student beginning with a manual of this type is likely to develop the habit of interpreting ECG's on an intelligent basis of reasoning rather than from memory of empirical patterns or matching with labeled illustrative ECG's. The authors unfortunately referred too frequently to patterns and have included illustrative tracings which might be wrongly used.

This book contains no new concepts the basic material supporting the information given therein being taken from 219 references listed in the bibliography. The simple method of presentation of this material is however new and makes this one of the best texts on the subject of unipolar electrocardiography that is presently available. The manual is intended for the beginner and therefore should be ideal for the student but should likewise be valuable for the practitioner who desires to expand his knowledge by a workable understanding of unipolar electrocardiography.—Col. T. W. Mattingly MC, U. S. A.

A Textbook of Medicine edited by Russell L. Cecil M. D. Sc. D. Professor of Clinical Medicine Emeritus Cornell University New York and Robert F. Loeb M. D. Bard Professor of Medicine Columbia University New York. Associate editors, Alexander B. Gutman, M. D. Professor of Medicine Columbia University New York, Walsh McDermott, M. D. Associate Professor of Medicine Cornell University New York, and Harold G. Wiff M. D. Associate Professor of Medicine (Neurology), Cornell University. 8th edition. 1627 pages illustrated. The W. B. Saunders Co., Philadelphia, Pa. publishers, 1951. Price \$12.

It would be impossible in this review to comment on each entity or to remark about each change whether addition or deletion, in this excellent volume. It would also be unfair merely to "hit the high spots." Therefore I shall try to present my impression of the book as a whole. The authors and contributors are to be congratulated for presenting such a complete well integrated textbook and at the same time shorten the book by about 136 pages. This is quite a feat in view of the numerous and important advances made in the 4 years since the seventh edition was published. This has been accomplished by the use of a smaller type but in spite of this the book is not appreciably more difficult to read. Dr. Cecil also points out in the preface that the book was shortened without the sacrifice of any important material despite the fact that about 20 articles covering subjects not discussed in previous editions are to be found in this one.

As in the older editions the subject matter is well organized with a discussion of each entity in the logical sequence of definition etiology epidemiology pathogenesis symptoms diagnosis prognosis and treatment. The many illustrations are clear appropriately placed and include a few excellent color plates. Forty tables are found throughout the book and offer an excellent source of quick reference. The table of normal laboratory values of clinical importance on page 1551



shows several important changes and now lists the values of several chemical constituents only in milliequivalents per liter which is in keeping with current usage.

Frequent reference is made to the use of the newer therapeutic agents such as chloromycetin, tetracycline, cortisone and ACTH as well as certain surgical procedures. Newer concepts in diagnosis, pathology and pathophysiology are likewise mentioned. References are up to date and afford the reader an opportunity of further investigation or reading where desired. The senior editor has been joined by Robert F. Loeb as co-editor and by Alexander Guzman, Walsh McDermott and Harold G. Wolff as associate editors. The book continues to be outstanding in its field an invaluable aid to students and specialists alike.—*Commander W. W. Driskill, MC, U.S.A.*

**Human Physiology** by Bernard A. Housay, M.D., Professor of Physiology, Director of the Institute of Biology and Experimental Medicine, Buenos Aires, Argentina, Juan T. Lewis, M.D., Professor of Physiology, Director of the Institute for Medical Research, Rosario, Argentina, Oscar Orfano, M.D., Professor of Physiology, Director of the Merced and Mari Fereyrea Institute for Medical Research, Córdoba, Argentina, Eduardo Braun Menéndez, M.D., Professor of Physiology, Member of the Institute of Biology and Experimental Medicine, Buenos Aires, Argentina, Enrique Hag, M.D., Professor of Pharmacology, (the School of Medicine, Rosario, Argentina), Eugenio G. Faglia, M.D., Professor of Physiology, Member of the Institute of Biology and Experimental Medicine, Buenos Aires, Argentina, and Luis F. Leleux, M.D., Director of the Institute for Bio-chemical Research, Campomar Foundation, Buenos Aires, Argentina. Translated by Juan T. Lewis, M.D., and Oliver T. Lewis, with foreword by Herbert M. Evans, M.D. 1117 pages. Illustrated. McGraw-Hill Book Co., Inc., New York, N.Y. publisher 1951. Price \$4.

This is an excellent comprehensive and up-to-date book. The practical application of human physiology predominates throughout. The research aspect, although referred to, is not overemphasized. The method of presentation of each subject separately, with rather extensive additional references, makes this an ideal reference book for the busy practitioner. In addition, the straightforward presentation of the subject under discussion, with ample illustrations, makes it an outstanding textbook for the medical student.—*Col. A. E. White, MC, U.S.A.*

**Large Quantity Recipe** by Margaret E. Torrill, M.A., Professor of Home Economics and Director of University Dining Hall, University of Washington, Seattle 8, Wash., D.C., with illustrations by John M. Connell. Selected and translated under the sponsorship of The American Dietetic Association. 414 pages. Illustrated. J. B. Lippincott Co., Philadelphia, Pa. publisher 1951. Price \$7.

This is a modern, up-to-date and well-written treatise on what the food service man perhaps waited for—the way of tried and tested and proved large quantity recipe. The recipes are presented in excellent sequence and in an easily readable form. The many helpful up-to-

emphasize important cookery and preparation points will be welcomed by the experienced and understood by the inexperienced. The book is not cluttered with material never used. The few tables included are accurate and practical.

A wide variety of recipes are given and the newer concepts of cookery are included as for example the section on ready mixes.

—E. M. Girard WMSC, U S A.

*Enzymes and Enzyme Systems: Their State in Nature* edited by John T. Edsall, A. L. Lehninger, David E. Green, Emile L. Smith, A. deas C. Maehly, Britton Chance, Edwin J. Cohn, Douglas M. Sargenor and Margaret J. Hunter. 146 pages illustrated. Harvard University Press, Cambridge Mass. publishers 1951. Price \$2.75.

This monograph is based on seminars and discussions from the University Laboratory of Physical Chemistry Related to Medicine and Public Health, Harvard University, by workers on enzymes and enzyme systems from widely separated laboratories. The first two chapters by Lehninger and Green deal with the highly complex systems of inter-related enzymes within the mitochondria. In the third chapter Emile Smith presents evidence for the importance of many metallic ions in the action of enzymes. Maehly in the fourth chapter describes the separation of peroxidase into its component parts and the process of re-synthesis from those parts. Chance then shows the quantitative interrelations of certain heme enzymes and demonstrates the great speed with which some of these reactions between large molecules can take place. These papers are highly technical in nature and would be of primary interest to the enzyme chemist. The last chapter by Cohn, Sargenor and Hunter on the state in nature of proteins and protein enzymes of blood and liver would be of interest to the physician engaged in experimental medicine. —Commander W. A. Dinsmore Jr MC USN

*Parasitic Infections in Man* edited by Harry Most. Symposium held at the New York Academy of Medicine March 15 and 16 1949. 229 pages illustrated. Columbia University Press, New York, N.Y. publisher 1951. Price \$4.50.

This is one of a series of symposiums held under the auspices of the Section on Microbiology at the New York Academy of Medicine in March 1949. As stated in the foreword by Gregory Schwartzman: "Unpublished symposia are soon forgotten but their benefits may be retained by prompt publication." The following papers were included: The World Health Importance of Parasitic Diseases by Paul F. Russell; The Significance of New Findings in the Life Cycle of Malarial Parasites by Clay G. Huff; Immunological Mechanisms in Parasitic Infections by James T. Culbertson; Immunological Diagnosis of Parasitic Diseases by John Horicevich; Diagnosis of Intestinal Helminths and Protozoa by Norman R. Stoll; Studies on Growth and Metabolism of *Endamoeba histolytica* by William B. Frye; the Physiology of Blood

Flagellates by Theodor von Brand Biochemistry and Metabolism of Malarial Parasites by Ralph W. McKee The Cakimoon of Malarial Parasites by Quentin M. Geiman, Metabolism of Helminths by Ernest Bueding Pharmacologic Evaluation and Clinical Application of Amebicides, With Special Reference to the Thiouracils by Marilyn H. Anderson The Status of Antimalarial Drugs by G. Robert Cooney Theory of Filariasis and the More Common Intestinal Helminths by H. W. Brown and The Treatment of Schistosomiasis by Frederick J. Brady Each chapter is followed by a good bibliography

—Capt B. A. Cole MSC, USA

Oral Rehabilitation Complete Occlusal Reconstruction Treatment of Dental Deformities and Related Subjects The Closed Bite by Jerome H. Schneitzler B.S., D.D.S., Consulting Dental Surgeon, Verna Hospital New York City Postgraduate Instructor in Prosthetics, New District Dental Society New York City Associate Fellow New York Academy of Medicine Fellow American Academy of Dental Medicine 1161 pages with 1157 illustrations The C. V. Mosby Co., St. Louis, Mo. publisher 1951 Price \$20

This valuable well illustrated text includes the author's personal experiences in the field of oral rehabilitation and a review of the pertinent literature. The author presents a comprehensive anatomic, physiologic and biomechanical discussion of the effects of loss of vertical dimension and malocclusion on the temporomandibular articulation and the resultant changes of the articulation on related and associated structures. The work of other investigators is reported without bias. The effects of various factors on the temporomandibular joint are summarized and the pros and cons are given in almost all instances.

The anatomy of the temporomandibular joint, ear muscles of mastication and the related structures is given. The author discusses the agreement for and against the consistency of the temporomandibular joint during life as well as the various movements of the joint. Good roentgenograms of the joint are necessary for proper diagnosis. Several roentgenographic techniques are illustrated and discussed. Treatment of the joint and orthologic techniques for the correction of certain deformities of the temporomandibular joint are presented. Almost two hundred pages are devoted to the presentation of an extensive review of the literature covering the neuroses attributed to the dysfunction of the temporomandibular joint.

A complete understanding of occlusion muscle balance various types of occlusion and normal vertical dimension and the freeway space are necessary for the successful management of oral rehabilitation. Occasionally the orthodontist can be of invaluable aid in the management of the case. After the author completely covers the information needed prior to attempting complete oral reconstruction he presents several functional and several anatomic techniques. These are shown, and in detailed illustrations of each step involved.

This book is well written and easily understood. The profuse use of illustrations is helpful in the understanding of the problems and solutions presented in the text. The bibliographies at the end of each chapter are exceptionally complete. This volume is recommended not only to the specialist, but to the general practitioner as well.

—Lt Col. E. H. Smith Jr. DC USA

*After the A Bomb?* (Emergency Care in Atomic Warfare), Edited by Charles F. Bekrens M.D., Commanding Officer Naval Medical Research Institute, National Naval Medical Center, Director Atomic Defense Division, Bureau of Medicine and Surgery, Navy Department. 182 pages. Thomas Nelson & Son, New York, N.Y., publisher 1951. Price \$2.50.

This treatise describes in concise and practical form both the broad and detailed plan of organization for the management of atomic bomb casualties. The text is divided into eight convenient chapters dealing with general considerations, rescue and first aid, care of burns, treatment of radiation illness, hospital and public health problems, and the management of personnel contaminated with radioactive materials, each chapter contributed by an expert in his particular field. A table of remedial agents is included. As the editor states, a wealth of source material dealing with atomic blast and radiation injury is available, but a concise treatise in handbook format outlining the responsibilities applicable to both civilian and military agencies seems most appropriate at this time. A reasonably extensive bibliography and handy index are included.—Lt Col. O. A. Whol MC USA.

*A Review of Medicine by Members of the Faculty, Northwestern University Medical School.* Edited by Benjamin Boches M.D., M.S., Ph.D., Associate Professor of Nervous and Mental Disease, Northwestern University Medical School, Attending Neuropsychiatrist, Passavant Memorial and St. Luke's Hospitals, Chicago, Ill., and Senior Consultant in Neurology, Veterans Administration Hospital, Hines, Ill. 6th edition, revised, appended and reset. 814 pages. Northwestern University Medical School, Evanston, Ill., publisher 1951. Printed by The Chief Printing Co., Chicago, Ill. Price \$15.

This book, with its unusual background, has been rewritten from cover to cover with new chapters and sections since the last printing 8 years ago. Eighteen years ago the first typewritten and mimeographed edition of the Cook County Notes was edited as a series of lectures at Northwestern University Medical School and 16 years ago the first lithographed "Lectures of the Cook County Hospital Quiz Course." In 1940, with the fourth edition, the current name was adopted. To facilitate easy reading, the material for the most part is presented in a running narrative style.

The chapter on general medicine is concerned mainly with the infectious diseases, diseases of the lung and pleura, and diseases of the cardiovascular renal system. Some of the subjects such as lobar pneumonia, typhoid fever, and diphtheria for example, have relatively too much space allotted them. The chapter entitled "Special Lectures

on Medicine contains an excellent new section on tuberculosis which presents an admirable scholarly discussion of the subject. The sections on the blood diseases present good workable clinical outlines. The new section on antibiotics and sulfonamides is a valuable addition. The sections on general surgery diseases of the thyroid and peptic ulcer are exceptionally good. The chapter on Special Topics in Surgery has new sections on spinal cord injuries and gangrene. The new section on cancer presents a well rounded practical discussion. The last half of the book presents a practical review of obstetrics gynecology genitourinary surgery orthopedics pediatrics otolaryngology ophthalmology neurology and dermatology. The authors have tried to discuss the diseases peculiar to these specialties in a manner helpful to the general practitioner. For the most part these special subjects are well handled although in a few places academic details are too space consuming. The chapter on neurology has many well prepared sections. The chapter on dermatology has been given considerable space which is a refreshing departure from the scanty attention this subject receives in most medical schools. Tuberculosis of the skin is discussed at too great length. The chapter on total approach to diagnosis (a discussion of psychosomatic medicine) is much too short when one considers its current medical importance. A few sections throughout the book are not up to date especially in regards to treatment with newer antibiotics, DDT, cortisone, ACTH, and other remedies.

—Lt Col. Richard I Crone MC USA

**Handbook of Pediatric Medical Emergencies** by Adolph G. D. Sancti, M.D., Professor of Pediatrics and Chairman of the Department of Pediatric Post-Graduate Medical School, New York University Bellevue Medical Center; Director of Pediatrics University Hospital, New York University-Bellevue Medical Center; Director of Pediatrics, Gouverneur Hospital, New York City, and Charles Varga, M.D., Instructor in Pediatric Post-Graduate Medical School, New York University Bellevue Medical Center; Assistant Attending Pediatrics, University Hospital, New York University Bellevue Medical Center. Asistant Visiting Pediatrician, Gouverneur Hospital, New York City. 284 pgs.; with 51 illustrations. The C. V. Mosby Co., St. Louis, Mo., publishers 1951. Price \$3.

This small handbook deals with some of the more common medical emergencies met with in the practice of pediatrics. It covers cardiac, gastric, gastrointestinal, genitourinary, neurologic and respiratory emergencies, drowning, poisoning, care of the premature and pediatric procedures. The material is presented in outline form. Details pertaining to any method of therapy would have to be obtained elsewhere. The chapters on the care of the premature infant and pediatric procedures are particularly good. A useful table which lists a large number of commercial sources of poisons is included in the appendix.

—Col. C. L. Wilborn J MC USA

*History of Pharmacy A Guide and a Survey* by Edward Kremers Ph.G. Ph.M. Ph.D. Sc.D. Late Director, Course in Pharmacy and Professor of Pharmaceutical Chemistry University of Wisconsin and George Urdang, Ph.G. D.Sc. Nat. Sc.D. Professor of the History of Pharmacy University of Wisconsin and Director of the American Institute of the History of Pharmacy 2d edition revised and enlarged. 622 pages 30 illustrations. J. B. Lippincott Co. Philadelphia, Pa., publishers 1951.

Although principally of interest to pharmacists and students of pharmacy the concomitance of pharmacy and medicine indeed their identity until recent times makes this book a worthy addition to the libraries of physicians. Only two-thirds of the pages are devoted to text and these are devoted principally to the growth of pharmacy in the United States although the general development from ancient times is adequately outlined in the initial portion of the book. The remaining one-third of the pages contain an extensive bibliography chronology appendix, and index adding greatly to the value of the book as a reference work. Chapter 11 gives a brief description of the origins of the Army Medical Corps and chapter 18 has a subchapter entitled The Pharmacist in the Armed Forces. The print is clear but notations and quotes in fine print tend to interrupt continuity and might better have been placed in the appendix or as footnotes. Half-tone illustrations having no relationship to the adjacent text are grouped in the middle of the book. Good histories of medicine and its allied sciences and branches are needed. The "History of Pharmacy" helps to meet that need.—Lt. E. S. Redfield Jr. MC, U.S.N.

*Methods in Medical Research*, Governing Board: Iwan H. Pag, Chairman A. C. Ivy Colin M. MacLeod Carl F. Schmidt, Eugene A. Stead and David L. Thomson Volume IV Maurice B. Visacher Editor-in-Chief Histochemical Staining Methods George Gomori Editor Fluid and Electrolyte Distribution, Louis B. Flexner Editor Scudie on Gastrointestinal Pressures Innervation and Secretions J. P. Quigley Editor Tissue Culture Methods C. M. Pomeroy Editor 306 pages; illustrated. The Year Book Publishers Inc. Chicago Ill. 1951 Price \$7

This fourth volume of the series has maintained the general excellence of its predecessors in the presentation of technical knowledge. It presents detailed methodology including critical and comparative comments and the discussion of principles. Information on working methods for medical investigation is made available in a reliable and inclusive form. Volume 4 has a section devoted to histochemical staining methods fluid and electrolyte distribution studies on gastrointestinal pressures innervation and secretions and tissue culture methods. A competent authority has acted as associate editor for each section. The book fulfills a need for the medical research worker in presenting the methods of study for investigation in a detailed descriptive fashion by individuals who have had a large practical experience. It is doubtful that a similar compilation and availability of material on methodology can be found published.—Commander H. A. Lyons MC, U.S.N.

**Practical Section Cutting and Staining** by E. C. Clayd, F.I.M.L.T. Senior Technician in the Morbid Histology Department at the Royal Free Hospital Institute of Pathology the Middlesex Hospital London 193 p. 21 illustrations. Chemical Publishing Co., Inc. Brooklyn, N.Y., publisher 1948. Price \$4.75.

This technical manual, according to the author is written primarily for technicians with little or no experience in various methods of preparing routine microscopic sections. The author attains his objective very well. He covers the basic principles of histologic technique. About one-half of the book deals with various special techniques for demonstrating amyloid, bacteria, calcium, collagen elastic fibers, fibrin, melanin, mucin, myelin, reticulum, and other substances. Most of the illustrations are diagrams demonstrating material and technique. This manual is recommended to technicians, both student and graduate and possibly to pathologists interested in teaching histotechnologic technique.—*Li P. K. Hamilton M.C. U.S.A.*

**A Text-Book of X-Ray Diagnosis** by British Authors in Four Volumes. Volume I Edited by S. Coleridge Shanks, M.D., F.R.C.P., F.F.R., Director X-ray Diagnosis Department, University College Hospital London. J. Peter Kerley, M.D., F.R.C.P., F.F.R., D.M.P.S., Director X-ray Department, Westminster Hospital Radiologist, Royal Free Hospital London. Additions 434 pages illustrated. W. B. Saunders Co., Philadelphia, Pa. publisher 1951.

It has been 10 years since the publication of the first edition of this British text which provided comprehensive survey in diagnostic radiology in 3 volumes. The new edition consists of 4 volumes with subdivision into the head and the neck, the chest, the abdomen and the bones and joints. Such a subdivision convenient for the radiologist as well as the clinician. In this second edition new ideas in diagnostic radiology have been evolved and old concepts discarded. Volume I deals with the central nervous system, the teeth and jaw, the eye, the accessory nasal sinuses, and the temporal bone. The new chapter on cerebral angiography is excellent and includes radiographs and diagram of the normal. The section on eye is devoted mainly to the localization of foreign bodies. The contact lens method of localization which has attained popularity in the Armed Forces is only mentioned.—*Commander C. Ashe M.C. U.S.A.*

**Oral Physiology** by John T. O'Rourke, B.S., D.D.S., Sec. D. Edited by Leroy W. S. W. Jr., M.D., D.M.D., Sec. D., Dr. P.H., Boston 333 p. 16. The C.V. Mosby Co., St. Louis, Mo. publisher 1951. Price \$5.

This book was written to refute the remark that teeth are trivial. To prepare his case the author has thoroughly reviewed the literature pertinent to the subject. The fact that because of longer life expectancy today more people survive to the age group 65 with consequent increase in tooth exposure time emphasized throughout the book. A final warning on the author's part that there are

greater prevalence of dental disease and loss of teeth. The first chapter presents statistics on loss of human teeth from caries, periodontal disease and malocclusion which indicates that a significant number of people will be handicapped from the standpoint of masticatory function by age 50. Chapter 2 develops the theme that mastication is the chief function of the mouth. Impaired or destroyed masticatory apparatus imposes an increased burden on the alimentary tract whereas the alternative change to a soft, predominantly cooked diet predisposes to nutritional inadequacies.

Chapter 3 is concerned with the purposes of mastication and its mechanics. The parts played by the muscles, tongue, palate, lips, cheeks and gums are considered separately. The temporomandibular articulation is reviewed as is the rest position. The act of mastication, the number of chews or length of mastication and an evaluation of the dentition in terms of masticatory efficiency including strength of bite with natural and artificial dentition is discussed. Other aspects of mastication are discussed in detail throughout the book. Single chapters are devoted to one aspect of the masticatory function. The concluding chapter discusses the relation of the physical character of the diet to the health of the supporting dental tissues. A bibliography is given for each chapter. The book is a distinct addition to the dental literature and should provide an insight into dental problems for kindred branches of the healing profession.

—Capt. E. C. F. Pollard D.C., U.S.A.

*Immunology* by Nobl. Pier e Sherwood Ph.D., M.D., F.A.C.P. Professor of Bacteriology, University of Kansas and Pathologist to the Lawrence Memorial Hospital, Lawrence, Kansas. 3d edition. 791 pages illustrated. The C. V. Mosby Co., St. Louis, Mo. publisher 1951. Price \$8.

Sherwood has aptly consolidated the findings of the past decade with the previous knowledge by omitting material from his previous editions considered as obsolete or superfluous and enriching each chapter with references to the recent findings in each branch of this field. His text is basically concerned with the equilibrium that exists in the interaction between parasite and host and the intricate phenomena that may shift this balance in one direction or the other. Although this well-written and easily-understood textbook is primarily intended for the medical student, it will be of great value to anyone desiring to become familiar with the basic principles of a field of medical science that is still in its infancy.

Emphasis is placed throughout the book on the changing points of view relative to natural and acquired immunity and allergy. New topics touched on in this latest edition are the new blood group factors as the anti-Lutheran, anti-Willis, anti-Levay, anti-kell and the anti-Cellano factors, the pathogenesis of latent infections, the mechanism of viral infections, the role of the vertebral veins in metastasis and the relation



of vitamins and endocrines to resistance. Ample space is given to the history and principles of the various diagnostic laboratory tests that are applicable to this field.

The author at times uses the short cut of references in place of full exposition. For example he states: "A great deal of light is being thrown upon the mystery of how infectious agents establish themselves within a tissue and cause cellular injury as a result of extensive research in the following fields: (1) The mechanism of action of the sulfonamides (Henry 1943)." The reader must refer to the article quoted to determine in which way the sulfonamides influence the above phenomenon. A few sentences summarizing the findings in the literature in such cases would greatly enhance the value of the text.

—Major A. Leibovitz, MSC, U.S.A.

Medical Dictionary in Three Parts. Engl. to French-German, Fre. to German-Engl. h., and German-Engl. h. to Fre. h. Dr. E. J. Hon. Editor-in-Chief with the collaboration of R. Ding, M.D., Prof. sec. of Nephrology, S.S.E. Gilder, B.Sc., M.B., B.S., T. Gordonoff, M.D., Prof. sec. of Pharmacology and Therapeutics, J. Kowale, M.D., Hon. Doc. of Internal Medicine, P. Knapp, M.D., Prof. sec. of Ophthalmology, F. E. Koby, M.D., Ophthalmology, P. Koenig, M.D., Gynecology and Obstetrics, L. Lüd, M.D., Prof. sec. of Anatomy, F. Lutz, M.D., Prof. sec. of Dermatology, J. Mader, M.D., Professor of Urology, A. v. Maralt, M.D., Prof. sec. of Physiology, J. L. A. and M.D., Prof. sec. of Pathology, J. Parrot, M.D., Oto-Rhino-Laryngology, F. Reulz, M.D., Prof. sec. of Pathology, Anatomy and Bacteriology, L. M. Sando, Ph.D., Endocrinology, H. S. Kalke, M.D., Prof. sec. of Gynecology and Obstetrics, Ch. S. Creten, Ph.D., G. Tondury, M.D., Prof. sec. of Syst. Anatomy, Ch. Willemer, M.D., Surgery, A. M. Walther, M.D., Prof. sec. of Pathology and Bacteriology, H. d. Wenzel, M.D., Prof. sec. of Gynecology and Obstetrics, H. W. M.D., Physiology and Physiol. Chemistry, H. Zisch, M.D., Prof. sec. of Physiol. Medicine and E. A. Zimmer, M.D., Radiology. Technical and Bibliographic Contributor: E. Loefer, 1417 p. G. & S. Scitton, Inc. New York, N.Y. publishers 1951. Price \$18.75.

This useful reference book gives the English, French and German equivalents for medical terms. A book of this size cannot be included as the single German-English or French-English medical dictionaries (I would estimate that it contains about 30,000 terms in each of the three languages), but its synoptic arrangement makes it more valuable than any other polyglot medical dictionary available. The typography and format are excellent producing an uncluttered page which makes the information quickly accessible and the book easy and pleasant to use. Dr. Veillon says in his preface that the principal limitation of the size of this volume has precluded the inclusion of all terms employed in medicine and its allied sciences so that we have to be content with a choice of expressions in current use. The unprecedented development of science in recent years makes it known that no dictionary can claim to be complete or free from some degree of error and omission. The comments which follow merely serve to illustrate some of the difficulties the author confronted.

The German *Fleckfieber* is correctly translated as *typhus fever* but *Typhus* is translated *typhus fever typhoid* which may be misleading. On the other hand, the three meanings of *Blase* (*bladder vesicle blister*) are carefully differentiated. Among the many compound words beginning with *Blut* *Blutspargung* (*hemostasis*) does not appear although *Blutstillung* does. *Blutversorgung* (*blood supply*) is not listed. *Magen brennen* and *Sodbrennen* are identical (*heartburn*), whereas the French equivalent *aigreurs* is given for the latter; it is omitted under the former. There are many cases of unnecessary cross references (e.g. *Magengrube* see *Herzgrube*) unnecessary because the definitions could be given in each place just as economically and much more conveniently for the user. In some sections of the book there seems to be an excessively thorough listing of Graeco-Latin terms which vary in the three languages only in their endings (e.g. *bysteromyomectomy bysterovariotomy bysteropexy et cetera*). The good points of this book, however, far outweigh its shortcomings. Most medical men will find it a very practical and helpful dictionary.

—Lt Col F. B. Rogers MC, U.S.A.

**Manual of Massage and Movements** by Edith M. Prosser T.M.M.G. Trained Nurse and Certified Midwife. Member of Council of Chartered Society of Massage and Medical Gymnastics 1936-44. Sister in Charge Massage Department and Principal of School 1930-1949; continuing Examiner for Chartered Society of Physiotherapy at the Middlesex Hospital, London, since 1928. 388 pages illustrated. J. B. Lippincott Co., Philadelphia Pa. publisher 1951. Price \$6.

This book begins with a complete discussion of technique, application, contraindications and physiologic effects of massage. The portion that deals with therapeutic exercise begins with a discussion of the law of gravity and its relation to the human body. There are illustrations and a detailed discussion of exercise axes and planes of movement, properties of muscle classification of movements and when and how to apply each type of exercise plus the fundamental positions of all exercise. Every joint in the body is described clearly and specifically. The description includes the axes, planes and possibilities of motion with the muscles of each joint. Match-stick figures are used to illustrate points and may be easily copied. Five pages are devoted to the examination of the spine. The last three chapters are written about deformities of the spine with suggested corrective exercises. This manual is a good reference book to have in a rehabilitation department. —Lt F. M. Frazier MC, U.S.N.

**Diagnostic Standards and Classifications of Tuberculosis** 1950 edition. 64 pages. National Tuberculosis Association, New York, N.Y. publisher, 1950.

This new edition of a familiar pamphlet incorporates new material and revisions. A new classification of pulmonary tuberculosis is presented in this manual. —Commander H. A. Lyons MC, U.S.N.

*History of Neurological Surgery*, edited by A. Earl Walker, M.D., Professor of Neurological Surgery, The Johns Hopkins University, Contributor: William J. Atkinson, Frank H. Brown, John S. Crawford, Robert G. Fisher, Robert E. Green, Herbert C. Johnson, James Warham, Curtis Warhall, De Mond C. O'Connor, W. F. G. Sierra, Alfred F. Thompson, and A. Earl Walker. Editors: Cornwell, Robert E. Green, Herbert C. Johnson, and W. Fugate Sierra. 583 pages. Illustrated. The Williams & Wilkins Co., Baltimore, Md. publisher 1951. Price \$12.

During the winter of 1949-50 at Johns Hopkins University a number of seminars were held on the history of the development of neurosurgery. The papers by members of the Division of Neurological Surgery are here collected and constitute the first adequate history of this recently established specialty. Surgical techniques, the development of surgical approaches to anatomic areas such as the posterior fossa, the hypophysis and the third ventricle, the progress of psychosurgery and operation for pain, epilepsy and disease of the peripheral nerve are discussed. Some of the information was gleaned from as long as 3000 B.C. from periods of Babylonian and Egyptian cultures and from the pre-Columbian era in Peru. There are 14 biographical sketches of the pioneers of neurosurgery during the twentieth century. These are concise but informative and are scattered throughout the book in two-page interludes between chapters. An extensive bibliography is given for each chapter.

The appeal of this book will be mainly for neurosurgeons, but the history of the development of the fundamentals of neurosurgery will be of interest and value to neurologists, neuropathologists and neurophysiologists. It will prove valuable to the student and the experienced neurosurgeon and will please the older neurosurgeons for their own participation in the rapid improvement in the specialty. The course of the twentieth century neurosurgery is frequently shown in the clarification of facts previously surrounded in fear and ignorance. To the young student the book shows a direction of purpose. The description of the fundamentals involved in the past and present problems points the way to solutions which will inspire him. A book of this nature will help the student to consolidate some of the myriad of scattered data in his increasing fund of knowledge. To the practicing neurosurgeon it is beneficial to read of the difficulties encountered by predecessors and the solution of these difficulties by the clinical application of anatomic, physiologic and histologic principles.

—Lt. Col. G. Clark, MC, L.S.A.

*Annual Review of Medicine*, Volume 2, by Edward C. Cawling, Editor, Stanford University School of Medicine, and Harry W. Sherman, Associate Editor, Stanford University School of Medicine. 495 pages. Annual Review Press, Stanford, California. 1951. Price \$5.

The recent addition to the series of *Annual Reviews* follows the familiar pattern. The broad interpretation of the term "Medicine" is indicated by the inclusion of comments on medicine in a form by

Meiklejohn diseases of the male reproductive system by Nelson and Heller social psychiatry by Lindemann and the general adaptation syndrome by Selye The article on physical agents and trauma by Behnke of the Navy Medical Corps and the discussion of rheumatic diseases by Kuzell were especially interesting There are many references to ACTH and cortisone throughout the book Extensive bibliographies complement each article

—Commander H J Alvis MC, U.S.N.

Human Engineering by L. E. Axt (Conference Chairman) L. S. Beale J. A. C. Blaschke J. G. Catronis A. Chapanis H. D. Eberhart H. Elftman H. H. Hansen V. T. Inman W. E. Koppauf J. L. Kennedy L. C. Mad R. A. McFarland C. P. Sest E. V. Smith and C. L. Taylor Editor Roy Waldo Uline Associate Editor B. J. Hengstenberg Consulting Editor Lawrence Edwin Axt Volume 51 Art. 7 Pages 1123-1278 of Annals of The New York Academy of Sciences Illustrated The New York Academy of Sciences New York publisher 1951 Price \$2.75

This monograph consists of a series of articles resulting from a conference held by the Section of Psychology of the New York Academy of Sciences The various chapters are unique and self sufficient. No attempt has been made to write a textbook in logical sequence The articles clearly elucidate the meaning of the phrase "human engineering" give many examples of problems in the field and describe in detail the methods used in meeting specific problems The definition given in the book limits human engineering almost exclusively to engineering psychology It is stated that the problems of human engineering are problems of engineering, medicine and psychology This is brought out in connection with such fields as lighting vision hearing sensory mechanisms prosthetic devices and the operation of controls. Unfortunately this narrow approach leaves out the broader aspects of "bioengineering" which embraces all of the medical allied sciences and engineering For example the physiologic limits of escape from aircraft involving an engineering approach to anoxia frostbite opening shock of parachutes acroembolism et cetera would not be covered by the definition of human engineering as given in this monograph —Commander A. P. Webster MSC, U.S.N.

Handbook of Nutrition A Symposium, prepared under the auspices of the Council on Food and Nutrition of the American Medical Association 2d edition 717 page Published for American Medical Association The Blakiston Co Philadelphia, Pa. publisher 1951 Price \$4.50

This new edition of the Handbook of Nutrition has been organized into four parts titled (1) Individual Nutrients (2) Nutritional Needs (3) Nutritional Deficiencies and (4) Foods and their Nutritional Qualities The articles have been brought together in an orderly fashion The book is well indexed neatly bound and meets a definite need

—Commander H J Alvis MC, U.S.N.

Clinical Electrocardiography by A. Leon Graybiel, Captain MC, USN, Director  
of Research, U. S. Naval School of Aviation Medicine, Pensacola,  
Fla. 195 pages illustrated. J. Thomas Nelson & Son, New York, N.Y.  
published 1951. Price \$5.

*This monograph is in no way another edition of the previously published text on the subject with which the author was associated but an entirely different book with a new approach. Although it covers the field of clinical electrocardiography it is not a textbook for the beginner because most of the discussions are technical giving in considerable detail a new and simpler method of vector analysis the hexaxial system. The author states in the preface that an application of this method is to be found in the manner of presenting the bipolar and unipolar limb lead. It makes it possible to appreciate at a glance their true relationship and complimentary character.*

It should not be inferred from the above that basic discussion and description have been neglected. The manner in which the various cardiac conditions affect the electrocardiographic tracing have been adequately and commendably covered. The chapters on arrhythmia and coronary disease are outstanding. In addition to the usually included subject are discussions on the EKG in injuries, endocrine disorders, infections, anemia, and certain physiologic causes. The chapter on EKG in rheumatic fever is unusually sound. Yet throughout theoretical discussions are kept at a functional minimum.

It is commendable that consideration is consistently given to the 12 standard leads: the bipolar and unipolar extremity leads plus the 6 accepted chest leads. Additional chest and esophageal leads are frequently included in the illustration. The chapter entitled "The EFG in Healthy Persons" presents the clearest description of normal measurements of the various components including esophageal lead I have yet encountered. The author's style is simple, direct and descriptive. Page layout and large type on high quality paper add to the readability. The volume is profusely illustrated and adequately indexed.

—Col. C. L. Leedham, MC, U. S. A.





# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
Agency Department of Defense*



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ROBERT J. BENFORD, Colonel, U. S. A. F. (MC) Associate Editor  
HAROLD A. LYONS, Commander MC, U. S. N., Associate Editor

THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY  
THE DIRECTOR OF THE BUREAU OF THE BUDGET OCT 19 1949

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON 1951

For sale by the Superintendent of Documents, U. S. Government Printing Office  
Washington 25, D. C.



# Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

The Chairman of the Armed Forces Medical Policy Council and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy and Air Force to submit manuscripts for publication in this JOURNAL.

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The summary should be a factual and brief recapitulation of the observations or statements contained in the article. The conclusions drawn from the case, experiment, or facts set forth should be clearly stated and should appear at the close.

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Address: U. S. Armed Forces Medical Journal, Bureau of Medicine and Surgery, Department of the Navy, Washington 25, D. C.

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*United States Army*

ROBERT J. BENFORD *Associate Editor*  
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*United States Air Force*

HAROLD A. LYONS *Associate Editor*  
*Commander, Medical Corps*  
*United States Navy*

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OFFICE OF THE SECRETARY OF DEFENSE  
 AND THE JOINT CHIEFS OF STAFF  
 WASHINGTON, D. C.

LETTER transmitted to the Joint Chiefs of Staff  
 April 17, 1964

The purpose of this letter is to advise the Joint Chiefs of Staff of the progress of the study of the Department of Defense and the Joint Chiefs of Staff on the subject of the proposed changes in the structure of the Department of Defense and the Joint Chiefs of Staff. The study is being conducted by the Department of Defense and the Joint Chiefs of Staff in order to determine the most effective and efficient organization for the Department of Defense and the Joint Chiefs of Staff.

The study is being conducted in order to determine the most effective and efficient organization for the Department of Defense and the Joint Chiefs of Staff. The study is being conducted in order to determine the most effective and efficient organization for the Department of Defense and the Joint Chiefs of Staff.

The study is being conducted in order to determine the most effective and efficient organization for the Department of Defense and the Joint Chiefs of Staff. The study is being conducted in order to determine the most effective and efficient organization for the Department of Defense and the Joint Chiefs of Staff.

Very truly yours,  
 W. Randolph Souder  
 W. Randolph Souder, Jr.  
 Secretary of Defense

# Streptokinase and Streptodornase in the Treatment of Pilonidal Cysts

Joseph M. Miller, Major MC U S A. R (1)

Milton Ginsberg Major MC, U S A. R. (1)

Raymond J. Lipin, Lieutenant Colonel, MC, U S A. R (1)

Perlin H. Long, Colonel, MC, U S A. R (2)

THE number of man-days lost in the Army during World War II as a result of pilonidal cyst and its complications is estimated at about 3 470 000 (3). The treatment of this disease has been remarkable for the wide variation of methods used and poor results obtained. Delayed healing and recurrence are the primary problems still to be solved. A cyst which is not infected is treated best by excision and primary closure, and the results in this type were good toward the end of the war. A pilonidal cyst which is associated with gross infection or abscess presents a more difficult problem because the infection must be controlled before a curative operation can be undertaken. Since ambulatory treatment in the Armed Forces is impossible patients with infected pilonidal cysts must be hospitalized. Because patients must be kept until maximum hospital benefit is attained time lost from duty by such patients has been from 60 to 90 days. This loss of time became so great during the war that abscesses were incised and drained the patient returned to duty and a definitive operation postponed indefinitely. In the present mobilization large numbers of men with pilonidal cysts and potential pilonidal abscesses will be inducted. The clinical experiences of Tillett and his associates (4-7)

(1) Veterans Administration Hospital Fort Howard, Md.

(2) Department of Preventive Medicine, Johns Hopkins University School of Medicine, Baltimore Md.

(3) Figure furnished by Statistical Division, Office of the Surgeon General, U. S. Army.

(4) Tillett, W. S., Sherry, S., and Christensen, L. R.: Streptococcal deoxyribonuclease; significance in lysis of purulent exudate and production by strains of hemolytic streptococci. *Proc. Soc. Exper. Biol. & Med.* 68: 184-188, May 1949.

(5) Tillett, W. S.; Sherry, S.; Christensen, L. R.; Johnson, A. J.; and Hazelhurst, G.: Streptococcal enzymatic débridement. *Ann. Surg.* 131: 12-22, Jan. 1950.

with streptokinase and streptodornase in the treatment of infected wounds has permitted a more rapid preparation of pilonidal cysts as abscesses for curative operations. Streptokinase and streptodornase will effect changes in a grossly infected wound to make it one which is amenable to a curative operation. A more complete report on the action and the methods of application of these compounds will be found elsewhere (8).

These biologic compounds are not only efficacious in the preoperative period but may be used to advantage after operation. Short segments of ureteral catheters or polythene tubing may be placed laterally to the wound down to the deep fascia over the coccyx. Absolute hemostasis is difficult to achieve in an area which has been the recent seat of an inflammation. The accumulation of a small amount of blood beneath the skin flaps encourages infection because the blood is an ideal culture medium. The catheters afford a method to place streptokinase and streptodornase into the wound postoperatively to eliminate factors which permit infection. Streptokinase by causing fibrinolysis will allow more satisfactory evacuation of clotted blood. Air vent suction through the catheter will remove accumulation of blood or the products of enzymatic action and permit apposition of the skin flaps to the base of the wound.

#### CASE REPORTS

**Case 1.** A 25-year-old man was admitted to the Veterans Administration Hospital, Fort Howard Md., on 1 June 1950 with history of bloody repeated episodes of infection in a pilonidal cyst for about 3 years. A pilonidal cyst with sinus tracts from which purulent material drained, was present. An incision was made and a means of drainage provided on 14 June when a small amount of purulent material was released from the wound. *Staphylococcus albus* and diphtheroids were isolated from the wound. 100,000 units of aqueous crystalline penicillin G were given intramuscularly every 3 hours on 17 June but this was discontinued because of a questionable allergic reaction. One gram of sulfadiazine was given orally every 6 hours from 19 June through 28 June and 30,000 units of streptokinase and 20,000 units of streptodornase were applied topically to the wound 3 times between 16 June and 18 June. An excision of the pilonidal cyst and a primary closure were performed on 19 June 5 days after incision for drainage. The postoperative course was smooth and the patient was discharged from the hospital on 30 June.

(6) Sherry S., Talbot, W. S. and Chatterjee, L. P. Presence and significance of streptococcal autohemolysis in the purulent pleural exudate of pneumonia. *Proc. Soc. Exper. Biol. & Med.* 69: 177-184 Mar. 1949.

(7) Talbot, W. S., and Sherry S. The effect in patients of streptococcal fibrinolysis (streptokinase) and streptococcal deoxyribonuclease on fibrinous, purulent and sanguinous pleural exudation. *J. Clin. Invest.* vol. 29: 173-190, Jan. 1950.

(8) Miller, J. M.; Goshong, J.; Ligon, P. J.; and Long, P. H. Clinical response with streptokinase and streptodornase. *J. A. M. A.* 145: 670-674, Mar. 3, 1951.

**Case 2.** A 25-year-old man was admitted to the Veterans Administration Hospital on 3 July 1950 with an abscess in a pilonidal cyst. An incision for drainage had been made elsewhere in 1945. Pain and swelling had been present before this admission for about 4 days. From 3 July through 16 July 50 000 units of aqueous crystalline penicillin G were given intramuscularly every 3 hours. The dose of penicillin was increased to 100 000 units from 17 July through 25 July and 1.5 grams of gantrisin were given orally 4 times a day from 17 July through 20 July. At the time of operation on 5 July about 30 cc. of purulent material were released from the abscess. A hemolytic *Staphylococcus aureus* was cultured from the wound and 50 000 units of streptokinase and 75 000 units of streptodornase were applied topically to the wound 4 times between 7 July and 14 July. Forty thousand units of streptokinase and 60 000 units of streptodornase were applied on 16 July. Excision and primary closure were performed on 17 July. Postoperatively the wound healed well. The patient was discharged from the hospital on 28 July.

**Case 3.** A 25-year-old man was admitted to the Veterans Administration Hospital on 6 August 1950 with an abscess of 3 weeks' duration in a pilonidal cyst. An incision for drainage was provided on 7 August when about 30 cc. of malodorous purulent material were evacuated from the wound. A *Streptococcus anaerobius* was cultured from the purulent material, 50 000 units of streptokinase and 75 000 units of streptodornase were applied topically to the wound 4 times between 8 August and 14 August. An excision of the pilonidal cyst and a primary closure were performed on 15 August. The wound was well healed when the patient was discharged from the hospital on 29 August.

**Case 4.** A 31-year-old man was admitted to the Veterans Administration Hospital on 28 August 1950 with an abscess in a pilonidal cyst present for about 10 days. An area of induration about 5 cm. in diameter was present over the sacrum. The patient had had numerous episodes of infection in the preceding 9 years. From 29 August through 3 September 300 000 units of aqueous crystalline penicillin G were given once a day. The same dose of penicillin was given twice a day from 5 September through 8 September then once a day through 11 September. An incision for drainage of the abscess was made on 29 August. A micro-aerophilic gamma streptococcus was isolated from the wound. 50 000 units of streptokinase and 23 750 units of streptodornase were applied topically to the wound on 30 August and 31 August, 20 000 units of streptokinase and 9 500 units of streptodornase were applied on 5 September. A small piece of urethral catheter was inserted through each buttock into the wound and these catheters were removed on 8 September. The wound was well healed on 15 September and the patient was discharged from the hospital on 19 September.



**Case 5.** A 28-year-old man was admitted to the Veteran Administration Hospital on 4 October 1950 with a history of repeated episodes of pain and tenderness in the coccygeal region. About 3 days before admission the area became tender, red, and swollen (Fig. 1). An incision for drainage was performed on 6 October and 10 cc. of purulent material obtained. *Streptococcus faecalis* was isolated on culture from the wound. 300,000 units of aqueous crystalline penicillin G were given intramuscularly daily and continued to 3 November. 100,000 units of streptokinase and 150,000 units of streptoderma were applied topically to the wound daily 8 times between 7 October and 14 October.

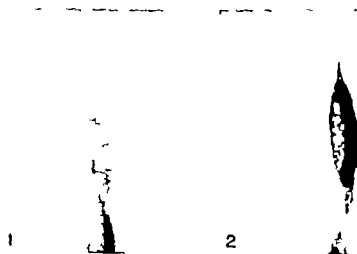


Figure 1. (6 October). Abscess of pilonidal cyst. Figure 2. (9 October). Wound after incision and treatment with streptokinase and streptoderma for 2 days.

(Fig. 2). An excision of the pilonidal cyst and primary closure was performed on 16 October with ureteral catheter drainage (Fig. 3). The ureteral catheter was removed on 21 October. There was no residual local red skin infection in the region of the lower two-thirds of the wound (Fig. 4) which rapidly closed and the incision was healed by 14 November.

**Case 6.** A 28-year-old man was admitted to the Veteran Administration Hospital on 17 January 1951 with an infected pilonidal cyst. The abscess was incised on the 18th day and about 10 cc. of purulent material was released from the area. *Aerobacter aerogenes* was isolated from the pus. 300,000 units of aqueous crystalline penicillin G were given intramuscularly daily from 17 January through 17 February and from 17 January through 17 February 300,000 units of streptokinase and 150,000 units of streptoderma were applied topically to the wound from 18 January through 17 February. The edges of the pilonidal cyst and primary closure were postoperative.



Figure 3. (17 October). Area of operation on fourth postoperative day. Note polyibene tubing placed bilaterally. Figure 4. (31 October). Cyst almost completely healed.





Figures 3. (17 October). Area of operation on fourth postoperative day. Note polythene tubing placed bilaterally. Figure 4. (31 October). Incision almost completely healed.



of such treatment is usually lengthy. The introduction of streptokinase and streptodornase afford the surgeon a new method of treatment to prepare infected wounds for curative operation. Air vent suction provided by catheters offers an additional way to facilitate healing. Streptokinase and streptodornase may be introduced into the wound postoperatively by the catheters and the products of digestion of fibrin and desoxyribose nucleoprotein removed.



# Thoracic Injuries in World War II

## III The Surgical Treatment of Traumatic Lesions of the Intrathoracic Cardiovascular Structures (1)

Herbert D. Adams, *Commander MC, U. S. N. R.* (2)

**W**OUNDS of the thorax either major or minor whether caused by fragments bullets bayonets or knives have the serious potentiality of an injury to one of the many vascular structures of the thorax both superficially and deeply located in the thorax. It is difficult to estimate the incidence of this type of war injury because most of these wounds were undoubtedly immediately fatal. This is because a tourniquet or pressure control was not possible in most of these vascular injuries. This type of injury however was not always fatal because some of these patients reached base hospitals at great distances for definitive treatment. The hemorrhage was at least temporarily controlled by certain limiting anatomic structures and by the hematoma and infiltration of the surrounding muscles and tissues. The diagnosis was frequently missed because of the insignificance of the external wound or because of the lack of obvious extensive infiltration hematoma visible or palpable pulsation, or other significant physical findings. In many cases diagnosis was not made until an episode of serious secondary hemorrhage occurred. It became absolutely essential that every wound in this region be examined specifically for evidence of arterial or vascular injury especially by auscultation for the presence of a bruit and by roentgenologic examination for intrathoracic injury of vascular structures.

Because of the serious nature of the operation necessary to cure this type of injury surgical treatment was withheld long enough to insure a reasonably certain diagnosis ruling out bruises resulting from extrinsic infiltration and pressure on an artery or vascular structures.

(1) Part I, General Considerations, Alterations of Pulmonary Physiology and Therapy in the Initial and Reparative Stages, by Howard K. Gray, Captain, MC, U. S. N. R., and James D. Fryfogel, M. D., appeared in the August issue and Part II, Therapy in the Reconstructive Phase by Joseph P. O'Connor, Commander, MC, U. S. N. R., appeared in the September issue of this Journal.

(2) Lahey Clinic, Boston, Massachusetts.



and also functional bruise. Operation should be performed as promptly as possible however to avoid serious secondary hemorrhages pressure on adjacent structures, or a serious disturbance of the intrathoracic dynamics. Because no specific first-aid measures were effective this type of injury supportive measures were necessary to maintain the patient long enough to reach hospitals equipped for major thoracic surgical procedures. These injuries should receive priority above all other types of injury.

### CARDIAC INJURY

Penetrating wounds of the thorax with laceration of the heart produce massive intrapericardial hemorrhage and associated tamponade. In a small percent of the patients especially when there was only a laceration of the cardiac wall without penetration into the cardiac chambers, the intrapericardial hemorrhage did not produce an immediate lethal tamponade and the increasing intrapericardial pressure tended to control the hemorrhage from the cardiac musculature. Likewise a small missile passing into or through one of the chambers could also, at least temporarily produce a balanced tamponade with out immediate complete cardiac embarrassment. Under these conditions

certain small percent of patients with this type of injury reached adequate operative facilities where the pericardium could be opened widely the lacerations of the heart sutured, and the pericardium drained. It was not feasible to perform a temporary decompression of the pericardium in this type of injury as it was in patients with tension hemothorax or pneumothorax.

Because patients with tension hemo-pericardium can survive only a few hours at the most, the diagnosis must be made at once and established by the characteristic clinical findings of cardiac tamponade. This is characterized by profound cardiovascular and respiratory disturbance as evidenced by dyspnea, ashen cyanosis and shock accompanied by an extremely weak, thready pulse, greatly lowered pulse pressure, increased venous pressure and distant muffled weak cardiac sounds on auscultation. Because these patients will not tolerate even a moderate degree of cardiac compression for long, it is imperative that they be operated on by a left peristernal approach the pericardium opened and the hemorrhage from the cardiac wall or cardiac chamber controlled by carefully placed silk or cotton sutures. It is important to avoid the pleura because any pulmonary collapse might prove to be a serious factor in an already critical cardiorespiratory balance. If the pleura is inadvertently opened, closed drainage or preferably suction drainage of the pleural space operative to facilitate a rapid re-expansion of the lung as possible. Likewise the pericardium should also always be drained and in all of these injuries massive doses of penicillin should be given intramuscularly.

## INTRACARDIAC FOREIGN BODIES

Intracardiac fragments lying freely within a cardiac chamber, whether washed there in the blood stream having entered the vascular system at some distance from the heart, or whether they have penetrated directly through the cardiac wall and lie freely in a cardiac chamber should also be removed. Because the patient is usually in severe shock, the added manipulation and loss of blood entailed in the removal of such a fragment from a cardiac chamber must be put off until the patient has wholly recovered from his initial loss of blood and cardiac tamponade but, when his condition permits either as a primary or a secondary operation after cardiac suture the pericardium is opened and a proper exposure of the chamber in question is obtained. Blood by transfusion should be flowing through at least two large-caliber needles into every patient with major cardiovascular injury while he is undergoing any type of operation for relief of the injury. With the patient fully controlled in this manner a purse-string suture is laid in the wall of the chamber in question and a circle of mattress sutures also taken into the wall for the control of that particular area during the probing for the fragment and the closure of the opening through the cardiac wall after its removal. An incision is then quickly made through the wall in the center of these controlling sutures and a heavy pair of forceps passed into the cardiac chamber, simultaneously tightening the purse-string suture and applying tension to the surrounding mattress sutures to control the blood loss around the probing instrument. The fragment is located by a bimanual maneuver and removed, the cardiac wall sutured and the pericardium drained. It is likewise advisable as soon as the patient's condition will permit, to remove fragments imbedded in the pericardium or free in the pericardium, or imbedded in or in contact with the wall of the aorta pulmonary artery superior vena cava, subclavian or innominate or proximal carotids because of the great danger of erosion and serious secondary hemorrhage or the development of an aneurysm.

## INJURY TO MAMMARY AND INTERCOSTAL VESSELS

Although it is a well-established fact that hemothorax should be treated by aspiration in its early phases, it must be kept constantly in mind that such an intrapleural hemorrhage may be arising from a laceration of the mammary or intercostal arteries or one of the hilar arteries which will require early operation in order to prevent death. Injuries to the mammary and intercostal arteries were of two general types (1) false aneurysms with subpleural hematoma infiltration and delayed external secondary hemorrhage and (2) those associated with intrapleural laceration and continued intrapleural hemorrhage. This latter injury produced symptoms and signs of an increasing intrapleural pressure and mediastinal shift which progressed until death ensued in spite of oxygen therapy and thoracentesis unless the hilar artery

was ligated. This is in direct contrast to hemothorax resulting from injury to the lung, which was usually controlled by the pulmonary tamponade from the associated hemothorax.

Physical signs of uncontrollable progressive intrapleural tension hemothorax demand immediate exploration of the wound and careful search for a lacerated mammary or intercostal artery or, if this is found not to be the source of such progressive hemothorax then the thorax must be opened widely and the hilar structures exposed and inspected for a laceration of a major hilar pulmonary artery or vein. Such a vessel would necessarily require ligation regardless of the possibility of subsequent pulmonary damage although permanent pulmonary damage would be unlikely by such a ligation. Whenever thorax is opened widely in this early phase it is of course necessary that the thorax be drained by a closed method, preferably suction, in order quickly to re-establish normal dynamics and re-expansion of the lung.

### INJURY TO VASCULAR STRUCTURES IN THE MEDIASTINUM

Injuries to the mediastinal vascular structures were quite common and in most instances, if death did not occur at once from massive hemorrhage the hemorrhage was at least temporarily controlled by infiltration of the surrounding tissues with a resulting pulsating hematoma or false aneurysm.

### INJURY TO SUBCLAVIAN VESSELS

Injuries to the subclavian arteries were similar in many ways and in diagnostic findings to the injuries of other systemic arteries but being more deeply situated the external infiltration and hematoma were much less obvious and the diagnosis was made chiefly by the presence of a bruit and a widened mediastinum as evidenced by the roentgenogram. This was a rough bruit throughout systole or during the entire cardiac cycle if combined with an arteriovenous aneurysm. It was a common finding to have not only a false aneurysm but an arteriovenous aneurysm as well. This added complication of the arterial injury could often be diagnosed by increased venous pressure in the arm involved and by venogram showing a distortion or block of the vein at the level of the injury.

Functional bruits were fairly common in this region and had to be distinguished carefully. This could be done by examining the patient frequently. The functional bruit varies considerably from examination to examination and in relation to the position of the patient and the position of the upper extremity. Likewise, simple compression from external pressure and infiltration about the artery may produce bruit. It is again essential to distinguish, if possible, between compression and true laceration of vessel with a false sac in which surgical treatment is essential to effect cure. If there is any question regarding the diagnosis of the type of bruit heard, that is whether it is caused by a false aneurysm or by a combination with an arteriovenous aneurysm

or whether it is caused by external pressure or whether it is a functional bruit, it is usually safe to keep the patient in bed under observation. As long as there are no signs or symptoms of further infiltration or cardiac damage, a period of close observation is justifiable. The functional bruits can be ruled out by their inconstant nature; the bruits caused by pressure gradually decrease in intensity as the roentgenologic signs of infiltration diminish and the patient improves.

Although the false aneurysms and arteriovenous aneurysms of the subclavian artery were the most hazardous surgical problems, the same general principles of management for all of the major vascular injuries were observed. In order to perform this type of operation it is essential to have a fully-equipped operating room, a trained anesthetist, adequate assistance, and continuous infusions throughout the procedure. It is found best to start the operation by tying large cannulas in the ankle veins of both legs so that if one should plug up at a crucial time in the operation the other could carry on satisfactorily. If a severe hemorrhage should be encountered, blood could be run through both as rapidly as possible.

The general principle of approach to this type of injury was to avoid entering the false aneurysm at any point before the major artery and vein, both proximal and distal to the injury, and all significant branches entering into this section of the injured vessel were fully controlled. This was accomplished by complete and accurate exposure of these vessels proximal and distal to the infiltrated site of the false aneurysm, and by control of the flow through these vessels by tension on small soft catheters placed around the vessels. The vessels were then further exposed until finally the false aneurysmal sac was entered and the injury in the artery visualized. Even with full control of the injured major artery and vein, both proximal and distal to this site and of all major branches entering this site, there was still a rapid flow of blood from the injured part into the sac. The artery and vein were then ligated carefully both distal and proximal to the injury and the injured part was excised carefully preserving for collateral circulation all branches that did not immediately enter into the tissue to be excised.

In general, quadruple ligation and excision of the injured section of artery and vein is the procedure of choice from the standpoint of the greatest safety and curability. This more radical management was usually necessary owing to the extensive damage to the vessels and surrounding tissues, making repair or anastomosis of the artery hazardous because of potential secondary hemorrhage or recurrence of the false aneurysm. In early cases and those in which reasonably normal tissues are encountered, however, arterial reconstruction or excision and end-to-end anastomosis, if accomplished without undue tension, are the best methods of management. Great care and judgment must be exercised in deciding and applying these procedures.

To approach the subclavian vessels a low cervical incision was made above the medial end of the clavicle. The lateral clavicular insertions of the sternomastoid muscle were cut and the carotid sheath and its contents retracted medially. The *calculus anticus* muscle was exposed and the phrenic nerve freed and retracted medially. The scalenus muscle was then cut across and the subclavian artery exposed and a catheter passed around it for tourniquet action. Connecting with the original incision, a diagonal incision was then made across the pectoral region similar to that for axillary exposure except that the pectoral muscles were split for the exposure of the axillary vessels immediately below the clavicle and catheters passed around them for control. The clavicle was then cut across and the ends retracted widely by exposing the injured part of the subclavian vessels. Dissection of these vessels was carefully carried out in both directions until the neck of the sac and false aneurysm were isolated and entered. Here again, considerable bleeding was accepted in the final identification of the opening in the artery. The artery and vein were ligated proximal and distal to the laceration and the injured part excised. Because the brachial cords were closely associated with the aneurysmal sac the missile had often done direct damage to these nerves and further damage could be demonstrated from the direct pressure on and infiltration of these trunks from the dissecting hematoma and false aneurysmal sac. It was necessary to isolate them carefully and produce no operative trauma to these cords but no attempt was made to suture any of the cords that were found injured at this time. The clavicle was then wired together and the wound closed draining the wound with simple Penrose drains.

### INJURY TO THE INNOMINATE ARTERY

False aneurysms and arteriovenous aneurysms involving the innominate artery and innominate vein and the left subclavian and left common carotid vessels within the superior mediastinum were diagnosed primarily on the basis of bruit and the roentgenologic findings of infiltration of the superior mediastinum as well as induration extending into the suprasternal notch and the back of the neck.

Submanubrial and cervical pain were the outstanding symptoms. Again, because of the grave nature of the operation it was necessary to be certain that this bruit was not caused by some external infiltration and pressure on the artery. As long as the patient was kept in bed under close observation and there were no signs of cardiac hypertrophy or change the surgical procedure could be delayed to establish beyond question the presence of a false aneurysm. Several patients were observed in whom the roentgenologic signs of mediastinal infiltration and the bruit disappeared after weeks of observation. Continued pain however especially with exacerbations of pain, and increasing or undiminished bruit, or any sign of cardiac effects made

surgical intervention imperative. The same general approach was essential for this type of operation. Because of the extremely close relationship of the vessels in the superior mediastinum and the base of the neck it became much more difficult to avoid entering the false aneurysmal sac before adequate exposure and complete control of the injured vessel both proximally and distally were obtained.

A transverse incision was made across the midpart of the neck above the clavicles and the suprasternal notch which was then joined with a vertical incision over the midmanubrium. The suprasternal notch was exposed and the soft tissues were retracted to expose the entire manubrium and upper part of the sternum down to the level of the third interspace. The mediastinal tissues were carefully freed from the under surface of the manubrium and a short section of the sternum down to the third interspace. The mediastinal structures were protected with a thin spatula and the manubrium split in the midline carrying the division downward into the sternum to the level of the third interspace and laterally connecting these interspaces on either side. The manubrium and sternum were then retracted widely by a rib-spreader retractor. This gave good exposure of the entire superior mediastinum and the arch of the aorta. The innominate or whatever great vessel was involved, was then isolated at its origin from the arch of the aorta and a catheter passed around it for tourniquet action. The innominate vein was also isolated and controlled in a similar way. Just beyond the bifurcation of the innominate vessels the subclavian and common carotid arteries and their associated veins were isolated and likewise controlled with catheters. Finally with full control both proximally and distally by means of traction on the catheters or rubber-covered arterial clamps the aneurysmal sac was isolated and the injured section of the artery excised after careful ligation both proximal and distal to the laceration. The manubrium was then wired together and the superior mediastinum drained with a simple Penrose drain.

When these principles were observed, the mortality and complications were minimal, with only an occasional swelling and weakness of the upper extremity. No amputations were necessary and no treatment was required for any unusual circulatory disturbance in this respect. The extremity in question should, however be carefully watched and kept exposed at room temperature and every effort made to avoid constriction from clothing or position. Should significant circulatory disturbance develop, antispasmodic drugs and sympathetic blocks should be used. The patients recovered rapidly but the function of the upper extremity was variable depending on the degree of the original associated damage to the nerves and muscles. The lack of circulatory complications was undoubtedly the result of the age of these patients and most probably this procedure could not be used in an older group of patients without serious circulatory complications.

## COMMENT

This review of elementary principles was directed toward those whose contact with thoracic injury has been casual. Be the patient military or civilian, understanding of these basic principles will measure the success that attends the surgeon's therapy. The surgical judgment or decision as to when to initiate the specific measures of therapy is based on the correct interpretation of symptoms, physical signs, laboratory studies, and roentgenograms. The mastery of these diagnostic considerations is therefore mandatory. Although standardization of the resuscitative, reparative, and reconstructive measures is not possible as applied to an individual patient or even to a single surgeon, the success of these various methods as outlined has brought new order to the management of thoracic injuries.

# Notes on Field Surgery

Spurgeon H. Neel, Jr. Major MC, U S A. (1)

**F**UNDAMENTALLY there is no difference between operations accomplished under field conditions and those performed in garrison or large medical centers. The tissues of the combat soldier react to trauma and bacterial invasion in exactly the same manner as those of the civilian in mufti. The healing processes are identical and depend just as much on the previous state of nutrition and the skill of the surgeon. The combat soldier is heir to all the illnesses and injuries which plague his civilian comrade plus those injuries peculiar to modern warfare. These latter injuries, often incurred under the most adverse circumstances, are new to the junior field surgeon and deserve special comment. The basic physiologic and pathologic processes associated with war wounds are the same as those noted in more conventional injuries but the complicating factors, methods of handling and limitation in facilities are peculiar to the battlefield and the men who fight and die there.

The field surgeon is fortunate in that his clientele are selected young men in excellent health, who have been thoroughly trained and conditioned for combat. Surgery in this select group would be rather simple were it not for the fact that war wounds are usually incurred under the most unhygienic conditions in tired dirty men, who may not have eaten recently. The treatment of these serious wounds is hampered by the tactical military situation and equipment limitations in the light mobile forward medical units.

Definitive surgery is not the mission of the field surgeon and is beyond the capability of his medical installations. Further burdening of tactical medical units with heavy bulky surgical equipment and additional personnel would immobilize them to the extent of precluding effective close-in emergency medical care. The mission of the field surgeon and his installations is to provide emergency medical care to casualties and prepare them for evacuation to higher medical echelons. The extent of the technical procedures performed depends on the facilities available, the skill of the surgeon, but most of all on the tactical situation. Any procedure required to save life may and must be

(1) 82nd Airborne Division, Fort Bragg, N. C.



accomplished by the field surgeon. The life of the individual soldier is the prime consideration. In independent operations such as air borne assaults or units isolated by enemy action evacuation may be impossible and the field surgeon will be required to perform procedures normally within the province of higher medical echelons. An inflexible limitation on surgical procedures permitted is impossible and undesirable. The clinical judgment of the individual doctor is the final deciding factor and no surgeon will be censured for doing what was necessary to save life. Whether the patient lives or dies depends on his treatment in the forward combat area, his length of convalescence and ultimate effectiveness as decided in hospitals to the rear. The flexibility of forward medical service and the responsibility resting on the field surgeon require a familiarity with the characteristics of battle wounds and medical expedients. In addition to a complete basic knowledge of medicine and surgery.

The importance of proper nutrition, particularly adequate protein and vitamin intake to the healing of any type of wound is well established. Present Army field rations are adequate to preserve proper nutrition over varying periods of time *provided* they are consumed in toto. Many soldiers discard the vitamin supplements such as powder for making fruit drinks. This practice may lead to a vitamin C deficiency sufficient to cause dental and gingival disturbance and interfere with proper wound healing. Commanders must insure that troops eat their full ration despite remarks concerning the monotony or lack of palatability. I once had to resort to removing vitamin supplement powder from rations. Issued have a punch made in conjunction with the noon meal and require each man to drink on canteen cup of the concoction. A little drastic I'll admit but the dental health of the company improved. Assault-type canned or boxed rations should not be issued except as required by genuine military exigency. A proper ration, aside from its morale value may be lifesaving to a soldier wounded in battle.

Cleanliness to a combat soldier is more than a virtue. High speed penetrating missiles and especially shell fragments characteristically carry pieces of clothing into the wound with them. The temperature of the missile fragment renders them relatively sterile but the pieces of clothing introduced into the contused devitalized wound may be contaminated by a variety of aerobic and anaerobic organisms. These organisms thrive in the environment of a combat wound, delay healing and are difficult to treat even with antibiotics. A soldier entering action with clean skin, clean underwear and preferably clean uniform has a much better chance of survival, if wounded than a dirty soldier. A soldier should dress just as carefully for combat as for leave.

A soldier should evacuate both his colon and bladder before going into battle. Precipitous anxiety facilitates both of these functions but deterrents such as freezing weather, a small fox hole and enemy fire

may preclude fulfillment of these desires. A full viscus is more likely to be penetrated by shell or bone fragments than one which is empty and flaccid. Bowel or bladder injury is virtually unknown in parachute injuries because of the anxiety in the parachuting area. Pelvic injuries caused by automobile accidents by contrast are often associated with bowel or bladder injury because many persons neglect to stop long enough to relieve themselves.

Wounds about the head and neck are occasionally associated with strangulation due to obliteration of normal airways and aspiration of blood or vomitus. Emergency tracheotomy is a lifesaving procedure in patients with such wounds. The minimal equipment required for this procedure is available in any forward medical facility. Unconscious patients require no anesthetic and local anesthesia is sufficient for most others. Fountas-open tracheotomies were relatively common in World War II. Tracheotomy when indicated will not wait for evacuation to a hospital. It must be performed on the spot. In World War II I stood helplessly by in a collecting station and watched several men die from strangulation by blood and vomitus. I remained helpless until a technician fifth grade (now called private first class) connected a section of plasma tubing to the windshield wiper nipple on the intake manifold of a jeep and presented me with a cumbersome but workable suction apparatus. I added the refinement of a two-holed stoppered plasma bottle to catch the blood and prevent its entering the engine and had at my disposal an effective reliable suction machine. Strangulation ceased to be a problem.

Sucking wounds of the thorax associated with pendulum swinging of the mediastinum, trauma to the heart and shock to the patient, are fairly frequent problems in combat. The wound is easily closed with a wide strip of adhesive tape tightly applied over a sterile gauze compress but gradual decompression of the pneumothorax is a more difficult problem. Aspiration with a syringe but no manometer is a tedious process fraught with danger. This problem was solved for me by a dentist with a mechanical bent and practical knowledge of physiology. He shortened a plasma needle ground away its sharp edges and fixed a condom to its hub with a rubber band. He cut away the closed end of the condom making an effective one-way flutter valve. After closing the sucking chest wound he prepared a skin area, nicked it with a scalpel and inserted his sterile needle-condom apparatus. As the patient breathed he progressively decompressed his pneumothorax, came out of shock, and recovered uneventfully. I used this method on many other pneumothoraces with consistently good results.

The absence of proper lighting in forward medical units was another impediment to effective field surgery in World War II. Command-post type portable lights using wet-cell batteries have now been included in tactical medical tables of equipment to offset this deficit but an expedient used in World War II is still worthy of mention. Vehicles forward of the Army light line normally have their horns and

lights disconnected to preclude accidental betrayal to the enemy. Headlights complete with reflectors may be removed easily from utility vehicles. Two headlights connected by a long extension wire to the battery in a vehicle stationed immediately outside a blacked-out treatment facility will provide a source of constant reliable light for surgical procedures night or day.

These innovations are mentioned, not with the idea of claiming any credit for their discovery but with the idea of illustrating two important principles of field surgery. The first principle is that effective lifesaving operations can and must be performed in forward medical installations by combining a sound medical background with "Yankee ingenuity" in the development and use of field medical expedients. The second principle is that the tactical medical unit functions as a team. The surgeon must use each member of his team to the fullest extent. The mechanic with his suction apparatus and the dentist with his pneumothorax decompression device are but examples of the teamwork which can and must exist in forward medical installations. The surgeon must work through his assistants. Each procedure must be accomplished by the person with the least training who is capable of the task. Thus more highly skilled personnel are conserved for more technical duties. Each has his job and all contribute to the ultimate mission of the Medical Service—conserving fighting strength.

# Biliary Regurgitation During Cholangiography

Seymour A. Kaufman, Lieutenant, U.S.A.F.R. (MC)<sup>1</sup>

THE appearance of dye in the kidney pelvis during cholangiography has puzzled investigators for many years. The route of biliary regurgitation has been the subject of much speculation and it has only been lately that any light has been shed on the problem. My purpose in this article is to report a patient with such a phenomenon who also presented an additional, interesting roentgenologic finding.

## CASE REPORT

A 29-year-old, white married woman mother of three children, was admitted with a history of severe pain in the right upper abdominal quadrant of 1 month's duration following her last delivery and mild epigastric discomfort of 6 months' duration frequently associated with eating fatty foods. The severe pains were relieved by morphine and antispasmodics. She denied jaundice, dark urine, clay-colored stools and weight loss. On cholecystography 2 weeks prior to admission the gall bladder was poorly visualized.

Physical examination revealed a somewhat obese young woman with no jaundice of skin or sclera. The abdomen showed no tenderness, rigidity or masses. The urinalysis was negative except for a trace of bile reported on one examination. Urobilinogen was positive in the undiluted specimen only. The icteric index was 19.9. The prothrombin time was 15 sec. (100 percent). The plasma proteins were 6.4. The blood cholesterol was 250. The cephalin-cholesterol flocculation test was positive after 24 and 48 hours. The direct van der Bergh's test was positive. The serum bilirubin was 7.2 mg per 100 cc.

Five days following admission a cholecystectomy with exploration of the common duct was performed. The gallbladder was found to be tense with numerous omental adhesions. The cystic duct was dilated to 0.8 cm. in diameter and was filled with 6 small mulberry-type calculi. The common duct exploration was made through an opening in the common duct 1 inch distal to the cystic duct. Clear watery bile was encountered. Palpation, irrigation, and probing gave no evidence of a stone.

<sup>1</sup>USAF Hosp 241, W. W. Mather Air Force Base, Massachusetts.

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# Biliary Regurgitation During Cholangiography

Seymour A. Kaufman, *Lieutenant, U S A F R. (MC)*<sup>1</sup>

THE appearance of dye in the kidney pelvis during cholangiography has puzzled investigators for many years. The route of biliary regurgitation has been the subject of much speculation and it has only been lately that any light has been shed on the problem. My purpose in this article is to report a patient with such a phenomenon who also presented an additional, interesting roentgenologic finding.

## CASE REPORT

A 29-year-old, white married woman, mother of three children, was admitted with a history of severe pain in the right upper abdominal quadrant of 1 month's duration following her last delivery and mild epigastric discomfort of 6 months' duration frequently associated with eating fatty foods. The severe pains were relieved by morphine and antispasmodics. She denied jaundice, dark urine, clay-colored stools, and weight loss. On cholecystography 2 weeks prior to admission the gall bladder was poorly visualized.

Physical examination revealed a somewhat obese young woman with no jaundice of skin or sclera. The abdomen showed no tenderness, rigidity, or masses. The urinalysis was negative except for a trace of bile reported on one examination. Urobilinogen was positive in the undiluted specimen only. The icteric index was 19.9. The prothrombin time was 15 sec. (100 percent). The plasma proteins were 6.4. The blood cholesterol was 250. The cephalin-cholesterol flocculation test was positive after 24 and 48 hours. The direct van der Bergh's test was positive. The serum bilirubin was 7.2 mg. per 100 cc.

Five days following admission a cholecystectomy with exploration of the common duct was performed. The gallbladder was found to be tense with numerous omental adhesions. The cystic duct was dilated to 0.8 cm. in diameter and was filled with 6 small mulberry-type calculi. The common duct exploration was made through an opening in the common duct 1 inch distal to the cystic duct. Clear watery bile was encountered. Palpation, irrigation, and probing gave no evidence of a stricture.

<sup>1</sup>USAF Hospital, Westover Air Force Base, Massachusetts.

in the common duct, either in its free or in its retroduodenal portion. A No. 14 rubber T-tube was then inserted. The pathologist's diagnosis was chronic cholecystitis with gallstones consisting of 100 percent cholesterol.

About 48 hours after the operation the patient had a severe pain in the right upper abdominal quadrant. This was followed by slight clinical icterus. The patient responded well to analgesia and antispasmodics and had no recurrence of pain. On the fifth postoperative day a cholangiogram was performed using 35 percent diodrast. This revealed a common duct obstruction at the ampulla. There was complete filling and distention of the bile ducts and a peculiar honeycombed collection of dye over the liver area (fig. 1). No dye was seen to enter the duodenum. In 10 minutes the contrast medium was no longer seen overlying the liver but was visualized in the kidney pelvis and ureters.



Figure 1 (A) Two to four minutes following injection of diodrast. (B) Ten minutes following injection. Dye is seen in the right p. pelvis and ureters.

On the following day the patient was returned to the operating room. Exploration of the previous operative area showed the T-tube properly placed in the common bile duct. The T-tube was removed. Exploration of the common duct again revealed no evidence of stone by palpation, irrigation, and probing. A No. 10 F ureteral catheter was passed through the old exploratory opening in the common duct through the ampulla into the duodenum without difficulty and palpation again failed to reveal stone around this tube. The duodenum was now opened along its longitudinal axis in its second portion and the ampulla region explored from within. No stone was found. A No. 20 F rubber T-tube was then threaded over the ureteral catheter and fixed to it by suture. The ureteral catheter was then pulled out through the duodenal opening.

until the No. 20 F catheter had reached the ampulla. A sphincterotomy was then performed. This resulted in the liberation of a small impacted mulberry-type pigmented calculus which was removed and the T-tube threaded into the intestine. The proximal end of the T-tube was cut  $1\frac{1}{2}$  inches long and placed into the common duct as well. This gave the patient a clear communication between the liver and the duodenum with the distal limb of the T-tube projecting 4 inches down the duodenum.

The patient made an uncomplicated recovery. Laboratory findings prior to discharge were icteric index 5.3 cephalin-cholesterol flocculation test was plus-minus at 24 hours and positive at 48 hours direct van den Bergh's test negative serum bilirubin 0.97 mg. per 100 cc. urine urobilinogen negative plasma proteins 7.04, and A/G ratio 1.3/1. The patient was discharged with the T-tube in place and instructed to return to the outpatient department for observation.

### DISCUSSION

Mixer et al.<sup>2</sup> recently summarized the literature on biliary regurgitation during cholangiography and presented experimental observations. They noted, in their patients, that regurgitation occurred only when the contrast medium was used in patients with partial or complete obstruction of the ampullary end of the common bile duct. These patients had not only complete filling of the biliary duct system but one or both of the kidney pelves contained dye on several films of any one series.

The route followed by the dye from its injection into the biliary tree to its appearance in the kidneys is not entirely clear. Earlier investigators thought that there were direct communications between the bile capillaries and the blood capillaries of the liver. Others on the basis of similar experimental evidence and histologic study of injected liver specimens, concluded that regurgitation took place chiefly through the hepatic lymphatics and the thoracic duct. Recently it has been concluded that regurgitation took place through a combination of both routes depending on the stage of obstruction and the pressure applied to the biliary tree. In general, with lower pressures applied to the bile ducts the main route is through the lymphatics and at high pressures regurgitation has been demonstrated to take place directly into the hepatic sinusoids.

Mixer et al.<sup>2</sup> worked with dogs using diodrast thorotrast bacteria (*Staphylococcus aureus*) and radioactive phosphorus. They concluded that diodrast reached the kidneys by regurgitation through the liver into the blood stream rather than by simple absorption through the biliary duct mucosa. It was found that bacteria and other insoluble particles (thorotrast) could be forced directly into the blood stream thus explaining the febrile reaction often seen in patients with infected biliary

2Mixer, H. W.; Rigler, L. G.; and Gonzalez, M. V. Experimental studies on biliary regurgitation during cholangiography. *Gastroenterology* 9: 64-80 July 1947.



tracts following cholangiography. This was thought to be caused by rupture of the bile canaliculi so as to allow the passage of such colloidal matter directly into the blood stream. Very little pressure is needed to fill the biliary tree completely; it need be only slightly above the hepatic secretory pressure. The use of unnecessarily high pressure while injecting the dye has been cautioned against.<sup>3</sup> Radioactive phosphorus injected into the biliary tree could be traced in both the great veins and the thoracic duct, showing that the lymphatics were also involved in regurgitation as indicated above.

Of particular interest in this patient is the peculiar appearance of a collection of dye over the liver area. Although the cause of this unusual collection of dye is not apparent, it may represent diodrast distributed through the liver substance in the sinusoids. The obstruction of the ampullary end of the common duct resulted in dilatation of the biliary tree from the common duct up to and including the intrahepatic biliary radicles. The dye was inadvertently injected under slightly higher pressure than was necessary and this pressure was readily transmitted through the dilated, smaller biliary radicles to the sinusoids of the liver. This may have enhanced the transitory pooling of the dye in the liver. The dye over the liver area was seen very shortly after the injection but was no longer seen after it had appeared in the kidney pelvis. Thus, it might be assumed that after briefly causing opacity in the liver sinusoids the dye entered the venous circulation to be seen a few minutes later in the kidneys.

Whether the dye visualized was in the liver sinusoids cannot be definitely decided. The radiograph of this patient were widely distributed for examination by radiologists none of whom could either recall having seen a similar distribution or offer any explanation for it. These findings further emphasize the advisability of both immediate and postoperative cholangiography because in spite of adequate surgical technique in common duct explorations a few patients will require re-exploration to uncover common duct stones.<sup>4-6</sup>

3Hickman, N. F., McAllister, A. J., Frazar, B. and Crowder, E.: Technique, indication and value of postoperative cholangiography. *Arch. Surg.* 69: 1102-1113, Jan. 1950.

4Hickman, N. F., Stevenson, V. L., Frazar, B. J. and Crowder, E.: Technique of operative cholangiography. *Am. J. Surg.* 78: 347-355, Sept. 1949.

5Hickman, C. R., Hiram, J. R. and Mulvey, B. E.: Cholangiography in stone and cancer and operative injury of biliary ducts. *J. A. M. A.* 157: 687-690, Jan. 1948.

6Cotton, H. S., Caylor, H. D. and Turner, W. R.: Choledechochylasis. *Am. J. Surg.* 80: 514-522, Nov. 1950.

# Orthopedic Concepts in the Management of Rheumatoid Arthritis

Joseph W. Batch, Colonel MC, U. S. A. (1)

THE diagnosis and treatment of arthritis and allied conditions have become so complex that special training and study of these conditions are required of physicians. A rheumatology clinic should be established at any clinic or hospital which manages more than an occasional arthritic patient (2). Such a clinic should comprise the rheumatologist, the orthopedic surgeon, the physiatrist and, occasionally the radiologist and psychiatrist. The patients should be seen jointly in the clinic by this group and passed on to the appropriate member for treatment. When such treatment is completed, or periodically reviewed prior to completion of treatment the patient should be returned to the clinic for further evaluation.

The orthopedic surgeon can offer much help to the arthritic patient by the judicious use of appliances, casts and selective use of surgical procedures available to him. The orthopedic surgeon should be consulted early in the management of arthritic patients to assist in the prevention of deformities rather than waiting as is too often done until crippling deformities have developed. The role of the orthopedic surgeon in the management of arthritis is similar to his role in the management of poliomyelitis and his judgment, skill and ingenuity are equally taxed.

Although the orthopedic surgeon has a number of procedures in his armamentarium, it behooves him to enter on such projects with full realization of his limitations and a realization that his final results will not be as satisfactory as those in traumatic or postpoliomyelitis cases and that the reparative potentialities of a rheumatoid arthritic patient are decreased. He must be prepared to perform multiple pro-

(1) Army and Navy General Hospital, Hot Springs, National Park, Ark.

(2) Nicol, A. A. M., Vaughn, W. G.; Cowan, L. C.; and Harkness, J.: Organization of arthritis clinic. *Lancet* 2: 541, Oct. 2, 1948.

results in the form of deformities and invalidism, even though attempts have been made to maintain optimal position of joints. Rest, both general as obtained by bed rest, and local as obtained by cast and splints is still a very helpful measure in the treatment of arthritis (5, 6). Rest must be employed judiciously by the physician and balanced by a well conceived plan of activity (7). Periods of bed rest throughout the day alternated with periods of activity are to be prescribed, but complete bed rest should be discouraged or prevented. The patients must be encouraged to exercise their joints even though such activity causes some discomfort but not to a point of causing an exacerbation of symptoms.

Arthritic joints are painful and patients are prone to keep them at absolute rest and assume a flexed position of the joints to prevent pain. Unfortunately these positions of deformity often are encouraged by doctors and nurse in an attempt to make the patient comfortable. Pillows are placed under the knees, forearms, wrists, or hands, encouraging flexion. In an attempt to keep patients from being bedfast they are allowed to become wedged to wheel chairs with the result that shoulders, elbows, wrists, hands, hips, knees, ankles and feet are placed in a constant position of flexion and deformities result. Plaster of Paris casts are applied for the relief of pain and spasm, but are too often maintained for prolonged periods, and although the joints are placed in optimal positions stiff or ankylosed joints often result (8).

From the beginning it is important to place a patient on a schedule of activity teaching him exactly what he should do and how to do it. In the early cure stage rest is important, but must not be prolonged. As soon as exercise can be tolerated the patient should be taught actively to exercise muscle groups supporting affected joints so as to maintain good muscle tone and strength. The joints should be actively carried through full range of motion. It may be necessary to begin with passive motion of the joint graduating to active assistance then active and active resistance exercise. Pain may be alleviated by heat, intravenous or intra-articular procaine, or other medication prior to the exercise period. Every effort should be made to make the patient ambulatory. It is the doctor's responsibility to insist on this activity. If it causes discomfort he should seek measures to alleviate this discomfort. Undue fatigue is not to be allowed, but activity should be sufficient to maintain muscle tone and joint motion. This program of activity must then be augmented by periods of general bed rest.

(5) McCauley, J. C., Jr. *Measures of treatment and supportive orthopedic measures*. In Back, T. F. (editor): *Arthritis and Related Conditions*. F. A. Davis Co., Philadelphia, Pa., 1947, pp. 296-310.

(6) Kervasaugh, D. E. *Neurosurgical orthopedic management of rheumatoid arthritis*. J. N. Sec. New Jersey 42: 421-424, Sept. 1949.

(7) Law, W. A. *Surgery in treatment of rheumatoid arthritis and ankylosing spondylitis*. Proc. Roy. Soc. Med. 41: 253-260, Apr. 1948.

(8) T. Soper, W. S. *Treatment of rheumatoid arthritis*. *Lancet* 1: 469-472, Mar. 27, 1948.

for the patient and local rest for the affected part. For the spondylitic patient periods of bed rest on the Bradford frame should be prescribed.

The local rest of the affected joint is best obtained by a type of active elastic splint to be worn during the day between periods of exercise. They allow motion and exercise of the joint, maintain the joint in optimal position and provide support for the part. In this way they assist in preventing the development of deformities and in the correction of deformities already manifested. These splints must be individually designed and require a great deal of ingenuity on the part of both the doctor and brace maker. For night wear a rigid splint of padded metal or plaster of paris should be worn with the joints held in their optimal position.

In order to encourage ambulation use can be made of walkers, crutches and canes. Frequently the joints of the feet are involved and pressure can satisfactorily be taken off tender heels by the use of doughnut type heel cushions in the shoes and from the tender metatarsophalangeal joints by the application of metatarsal bars to the sole of the shoes.

In addition to the general medical measures used to relieve pain and arrest the disease much comfort can be obtained by the employment of physical therapeutic measures of mild heat in any form, such as hot packs, hot baths, heat cabinets, electric blankets, paraffin baths, infrared and massage (9-13). Heat must be mild because high temperatures are more harmful than beneficial and, at times dangerous (9). Heat is soothing, relaxes muscle spasm and has an analgesic effect. Light massage improves tone and circulation and reduces edema. Iontophoresis was advocated by Stengel (4) as the method of choice to relieve pain, spasm, edema and thickening about joints, being superior to commonly employed physical therapeutic measures which he claimed are harmful at times rather than helpful.

Mild deformities and pain frequently can be corrected by traction using Sayre head traction in cervical arthritis and leg traction for deformities of the knee. Manipulation under anesthesia at times may be helpful to correct deformities and should be followed by active exercises to retain the motion gained (5, 14). The use of wedging

(9) Walker, P. J.: Physical therapy in arthritis. *Ann. W. St. Med. & Surg.* 2: 320-324, July 1948.

(10) Klotz, P. M.: Physical medicine in treatment of arthritis. *The Hahnemann Monthly* 83: 164-169, Apr. 1948.

(11) Osborne, S. L.: Rehabilitation in rheumatoid arthritis. *Quart. Bull. Northwestern Univ. M. School* 22: 340-343, 1948; *Rheumatism* 4: 229-223, Oct. 1948.

(12) Solomon, W. M.: Physical treatment of arthritis. *J. A. M. A.* 137: 129-130, May 8, 1948.

(13) Haa son, K. G.: Physical therapy in arthritis. In Bach, T. F. (editor): *Arthritis and Related Conditions*. F. A. Davis Co., Philadelphia, Pa. 1947, pp. 311-338.

(14) Capener, N.: Orthopedics in rheumatoid arthritis. *Brit. M. J.* 2: 391-394, Aug. 20, 1950.

casts often is successful in the correction of deformities of joints whereby they may be returned to a position of usefulness (6, 15). Static exercises are important even during the period of wedging to maintain muscle tone and strength so as to be capable of maintaining the corrected position when the casts are removed. As muscle tone, strength, and joint mobility improve a variety of occupational therapeutic measures may be used to continue the improvement and provide a little variety to monotonous exercises (16). At times these measures may provide gainful occupation for the patient.

Bases (5) are frequently useful following or in conjunction with other forms of therapy to maintain an optimal position of a joint and in preventing the development of deformities. They are employed for almost all joints and must be individually designed.

### OPERATIVE TREATMENT

The operative treatment of arthritis is primarily performed to (1) relieve pain, (2) restore or maintain function and (3) correct deformities. It must be carried out as an adjunct to the medical management, not a substitute for it. The results of operation in rheumatoid arthritis will be less gratifying than similar procedure performed for static or traumatic conditions. This should not deter the surgeon, but should remind him of the difficulties to be encountered and to proceed cautiously. He should inform the patient not to expect a normal member although some improvement should result. He should also be told that the operation is intended to obtain a certain desired result and that reoperation may be necessary before this result is realized.

Care in the selection of patient for operation is important. The patient must be emotionally prepared for the operation, willing to cooperate fully pre- and post-operatively and physically fit to withstand it.

The orthopedist has an opportunity to employ a great many procedures in the treatment of rheumatoid arthritis. He will find that a single patient will call for a number of the procedures to obtain a single objective. The multiplicity of joint involvement only adds to the magnitude of the job and the time required to complete all procedures. This demands great patience and persistence on the part of surgeon and patient alike.

Among the procedures employed are the following (17-19):

1. The local injection of a 2 percent solution of procaine into the joint cavities sometimes mixed with 5 percent solution of lactic acid (pH 5.2).

(15) Levinthal, D. H., and Logan, C. E. Orthopedic and medical management of arthritis; preliminary report. *Journal-Lancet* 63: 48-50, Feb. 1943.

(16) Brokaw, E. H. Occupational therapy in treatment of arthritis. In Bach, T. F. (editor): *Arthritis and Related Conditions*. F. A. Davis Co., Philadelphia, Pa., 1947. pp. 359-363.

2. Double pin *traction* to correct a flexion deformity of the knees (6).
3. *Neurectomy* for the relief of pain, such as of the obturator and sciatic nerves to the hip
4. Posterior *capsulotomy* for flexion contractures of the knee and of the ankle is sometimes necessary when other measures fail to correct this deformity
5. *Capsulectomy* is indicated when the articular capsule has become adherent to the joint surfaces and contracted, thereby preventing motion. Removal of portions of the capsule releases this adhesive block and facilitates motion. The proximal interphalangeal joints can at times be restored to function in this manner. The metacarpo- or metatarso-phalangeal joints are especially responsive to this procedure to improve mobility
6. *Synovectomy* is performed primarily to relieve pain and interference of function caused by a thickened inflammatory synovial membrane. It is doubtful that a synovectomy removes a focus of infection which may spread the disease to other joints
7. *Resection* of a joint particularly with advanced destruction, is a valuable method of relieving pain in that joint and results in improved function often with a correction of deformity and cosmetic improvement
8. *Excision* of parts of bones and joints as well as hyperostosis which develops around joints facilitates a freer range of motion such as is observed following excision of the distal end of the acromion.
9. *Tendon transfers* are often a valuable adjunct to other procedures in the treatment of rheumatoid arthritis. The extensor tendons of the toes are often transferred into the neck of the metatarsals following resection of the metatarsal heads.
10. *Débridement* of joints particularly of the knee joint, removing all damaged and fibrillated cartilage as well as hyperostosis around the joint and patella, has restored useful painless motion in many cases
11. *Osteotomies* in the management of arthritis frequently have been used in the hip and knee in an attempt to correct deformities not corrected by other means where some motion remains in the joint. Smith-Peterson has devised a procedure to correct the flexion deformity of the spine by osteotomy through the vertebral articular facets.
12. *Arthrodesis* of joints in optimal functional positions is performed in patients with chronic deformities.

(17) Conroe, B. L.: *Arthritis and Allied Conditions*. 4th edition. Lea & Febiger, Philadelphia, Pa., 1949

(18) Mercer, W.: *Orthopedic Surgery*. 3rd edition. Williams and Wilkins Co., Baltimore, Md., 1944. pp. 389-433; 840-859

(19) Speed, J. S. (editor): *Operative Orthopedics* (Campbell's). 2nd edition. C. V. Mosby Co., St. Louis, Mo., 1949. pp. 837-907

13. In order to return mobility to ankylosed joint a variety of arthroplasties have been devised employing f scia, metal and acrylic as interposing materials. These procedures have been particularly adaptable to the metacarpophalangeal joint of the hand to the elbows and to the hips and some encouraging results have been seen in the knee.

14. A great variety of reconstructive procedures have been devised to improve function of joints.

15. As a last resort for the relief of intractant pain cordotomies have been performed.

With reference to classification operative procedures which have been found beneficial in the relief of pain and improving function include those directed to (1) the lower extremity (2) the upper extremity and (3) the back (3, 7, 20, 21).

**Lower extremity** In the lower extremity operative treatment should result in a painless stable extremity for weight bearing. Any of the joints of the lower extremity may be involved in the arthritic process and seriously hamper locomotion. The small joints of the foot are often involved with resultant clawing of the toes, hallux valgus deformity of the great toe, subluxation of the metatarsophalangeal joints, pain and deformity in the midtarsal and ankle joints and pain and periostitis about the calcaneus.

The clawtoe deformity can effectively be corrected by resection of the proximal interphalangeal joint and arthrodesis of this joint together with tenotomy or transfer of the extensor tendons. The depression and subluxation of the metatarsophalangeal joint can be corrected by resection of the metatarsal heads. This latter procedure will sometimes allow straightening of the toe by shortening the osseous structure thereby relaxing the contracted soft tissues. Resection of 1, 2, 3, 4, 5, the lateral 4, or all of the metatarsal heads has been performed on numerous patients with satisfactory results. I have found it advantageous to transfer the long extensor tendon to the neck of the metatarsal bone in addition to resection of its head. The hallux valgus deformity is best treated by the Feller operation.

Persistent pain, swelling and deformity in the midtarsal joints are best treated by arthrodesis of these joints although this has not often been found necessary. The periosteal reaction about the calcaneus produced by chronic rarely ever require surgical excision.

The ankle joint when involved tends to cause the foot to go into an equinus deformity if not properly protected. This deformity at times can be corrected by posterior capsulotomy and lengthening of the tendo

(2) Pack, T. F. Orthopedic intervention in arthritis. In Pack, T. F. (editor): *Arthritis and Related Joint Diseases*. F. A. Davis Co. Philadelphia, Pa., 1947, pp. 419-429.

(3) Leriche, L. H., and C. L. Kake, K. H., and F. Skibum, W. L. Practical management of arthritis — medical and orthopedic. *Indian Med.* 13: 377-386, May 1944.

achillis when wedging casts fail. Persistence of pain and deformity are indications for arthrodesis of this joint.

The knee joint is commonly involved early. It may only appear as a synovitis and respond to aspiration and elastic bandaging but as the synovia becomes thickened synovectomy offers an excellent means of relief. In more severe cases with uncorrected flexion contracture posterior capsulotomy often will allow for correction of the deformity. In some cases with slight range of motion and flexion deformity persisting after other means fail an osteotomy of the lower end of the femur will facilitate complete extension of the leg on the femur while maintaining the degree of flexion present. When the joint has been destroyed by the arthritic process arthrodesis of the knee is the procedure most likely to result in a painless stable knee. When both knees are involved the patient is severely handicapped and arthroplasty of at least one should be considered. This procedure has not been extensively used but offers great promise. Either fascial covering or Smith-Peterson vitallium knee plates may be used.

The ideal treatment of the hip joints is one which succeeds in obtaining a painless full range of motion with a stable joint. Unfortunately this ideal is seldom realized. The fact that so many operations have been devised for this joint bears witness to the shortcomings of most. In cases of bilateral involvement it is often necessary to sacrifice stability for mobility when both features cannot be obtained. At times the condition of the patient precludes extensive surgical intervention but it is imperative to do something to relieve pain. Occasionally this can be accomplished by an obturator neurectomy with or without neurectomy of the sciatic branch to the hip joint as employed in osteoarthritis. With severe pain and marked involvement of the joint the Girdlestone procedure with resection of the head and neck of the femur will relieve the pain and result in a mobile hip with fair stability (22). Displacement osteotomy of the femur sometimes results in a painless hip because of altered and improved mechanics.

Arthrodesis of the hip produces a stable painless joint but many patients object to the resultant lack of mobility. With bilateral involvement and in joints which have ankylosed it is desirable to produce mobility in at least one joint. This may be obtained by a Jones pseudarthrosis on one side or Smith-Peterson mold arthroplasty on one or both sides or with a metal or plastic hip prosthesis. When performing such an operation for rheumatoid arthritis the surgeon must be prepared to repeat the operation one or several times before succeeding in obtaining the desired results.

Upper extremity The joints of the hand and wrist are commonly involved in severe disabling deformities with dislocations of the

(22) Ratchelor J. S.: Excision of femoral head and neck for ankylosis and arthritis of hip. *Overseas Postgrad. M. J.* 2: 448-456, July 1948.



interphalangeal and metacarpophalangeal joints and flexion deformity of the wrist. These deformities can be corrected at times by resection of the interphalangeal and metacarpophalangeal joints. At times it is more desirable to fuse the interphalangeal joints in a functional position. Arthroplasty of the metacarpophalangeal joints is highly successful in producing a painless mobile joint in good alignment.

With marked deformity of the wrist it becomes desirable to ankylose the carpal joint. If pain is marked in the distal radioulnar joint resection of the distal end of the ulna provides relief. Involvement of the proximal radioulnar joint can often be relieved by resection of the head of the radius and partial synovectomy of the elbow joint. With more marked involvement of the elbow joint, arthrodesis or arthroplasty of this joint should be considered.

Involvement of the shoulder joint in the arthritic process results in involvement of the periarticular structures including the bursa. Much relief of pain and improvement in range of mobility will result from a Smith-Peterson's acromioplasty. When there is more marked involvement of the joint, arthrodesis of this joint may become necessary to relieve the pain and place the shoulder in a more favorable position.

*Spine.* In patients with spondylitis associated with a severe kyphosis, Smith-Peterson has devised a procedure whereby a wedge osteotomy is performed through the intra-articular facets and the spine is hyperextended and fused. This allows the patient to assume a more upright position.

*Jaw.* The temporomandibular joint is occasionally involved with pain, inability to open the jaws, and subsequent ankylosis. Resection of the condyles of the mandible usually relieves this condition.

### CONCLUSION

By careful and judicious selection of patients and procedures adapted to any particular joint, patients may be relieved of their pain, deformities may be corrected, and the function of the joints may be improved. The patients are thereby prevented from becoming hopeless cripples, are made ambulatory and may even regain the ability to carry on some type of gainful occupation.

# Meckel's Diverticulum Containing Heterotopic Tissue

## Report of a Case

John R. Weissert, Captain, MC, U S N (1)

**P**ERSISTENCE of the vitello-intestinal duct in postnatal life designated as Meckel's diverticulum is not uncommon occurring in from 1 to 4 percent of infants. Because it normally connects the midgut to the yolk sac in the first weeks of fetal life it is understandable that it may be the site of aberrant tissues derived from the developing midgut. Heterotopic tissue is reported to occur in about 20 percent of Meckel's diverticula and in about 65 percent of those with symptoms. Such aberrant tissue may be gastric or duodenal mucosa or pancreatic tissue or a combination of these. The finding of more than one type seems to be rare. According to a recent survey of the literature by Bigelow and Clark (2), the presence of both pancreatic tissue and gastric mucosa has been reported in only 8 patients. It is believed that aberrant tissue in a Meckel's diverticulum predisposes to the production of symptoms.

## CASE REPORT

A 20-year-old man was admitted to the U S Naval Hospital Quantico Va. on 7 July 1948 complaining of abdominal pain and nausea for the preceding 24 hours. The family history and the past medical history were not significant, and inventory by systems revealed no other complaints. The physical examination was negative except for point and rebound tenderness just to the right of and below the umbilicus with muscle guarding and spasm of the right rectus abdominis muscle. The white blood cell count was normal. The persistence of signs and symptoms indicated the need for operation. The preoperative impressions in order were acute appendicitis, regional enteritis, and

(1) U S Naval Hospital, Great Lakes, Ill.

(2) Bigelow R., and Clark, D. E.: Heterotopic pancreatic tissue and gastric mucosa in Meckel's diverticulum. Arch. Surg. 60: 157-163, Jan. 1930.



# Preoperative Diagnosis of Meckel's Diverticulum

George Alvary Major U. S. A. F. (MC) (1)

**I**N A condition which occurs as frequently as Meckel's diverticulum it seems highly probable that the blame for the failure to diagnose this lesion more often rests on the radiologist (2). Meckel's diverticulum represents the persistent remains of the fetal omphalo-mesenteric duct which communicates between the yolk sac and the primitive digestive tube. It degenerates by the seventh week of embryonic life and its persistence results in an anomaly which occurs in from 1 to 3 percent of persons, is usually recognized between the ages of 10 and 30 years; and occurs in men 3 times as often as in women (3).

Although about 70 percent of those persons with this condition go through life without requiring an operation for one of its complications (4), the diagnosis of Meckel's diverticulum before operation is seldom made. It is frequently suspected clinically in patients seen prior to appendectomy and, occasionally, the diverticulum is found to be the real cause of the symptoms. The roentgenographic demonstration of the diverticulum preoperatively is rarely possible (3, 5, 9) and in the lifetime of several roentgenologists has never been accomplished.

(1) Westover Air Force Base, Mass.

(2) Rousseau, J. P. and Marila, A. G. M. III. Meckel's diverticulum; preoperative roentgen diagnosis. *Radiology* 40: 605-607 Jan. 1943.

(3) Howell, L. M.: Meckel's diverticulum; an identification of anomaly with review of 61 cases. *Am. J. Dis. Child.* 71: 365-377 Apr. 1946.

(4) Allmann, R. Zur Diagnose und Therapie des chronisch-akut intermittierenden subtotalen Ileus. *Schweiz. med. Wchn. chr.* 64: 331-333, Apr. 14, 1934.

(5) Prævit, R. Meckel'sches Divertikel im Röntgenbild. *Röntgenpraxi* 8: 397 June 1936.

(6) Fuchs, H. P. A propos de la radiographie d'un diverticul de Meckel. *Mém. Acad. de chir.* 64: 313-318, Feb. 23, 1938.

(7) Case, C. and Bockus, H. L.: *Gastroenterology* W. B. Saunders Co. Philadelphia, Pa., 1944. Vol. II, pp. 120-122.

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Figure 1. Three-hour film. The terminal ileum and much of the colon is outlined. The Meckel's diverticulum is seen side by side and in close proximity with the efferent loop of ileum. There is no barium anywhere proximal to the attachment of the diverticulum. Note the tip of the appendix as it emerges from behind the cecum. Figure 2. Three-hour film. Lateral view showing the shadows of the diverticulum and efferent but distal loop superimposed on each other. This indicates the approximate diameter of the diverticulum filled with barium. The appendix is in full view. Figure 3. Five-hour film. Meckel's diverticulum is demonstrated by its ability to retain the barium mixture. The efferent loop of ileum is almost empty. Figure 4. Diagram showing the anatomy of the bowel as encountered at operation. At the attachment of the diverticulum, about 80 cm. from the ileocecal junction, the ileum is sharply angulated. The defect above the "head" was caused by adhesive bands within the mesentery.

shown in figure 4. Almost all of the barium mixture shown in the 3-hour plates was contained in a single loop of terminal ileum. The last few inches of the terminal ileum appeared almost as a straight tube. The diverticulum was seen hanging from the small intestine by a narrow base. At this point the intestine showed the characteristic sharp angulation. The diverticulum pointed downward. Deeply imbedded in the mesentery of this large loop the tip or "head" of the diverticulum was partitioned off by constricting fibrous adhesions as demonstrated by the roentgenogram. The diverticulum was dissected out and was excised together with the normal-appearing appendix. At operation no true diverticulitis was present but rather a mechanical disability existed which was caused by retention of food or barium in this blind loop that emptied with difficulty because of its dependent position, small opening and angulation of the bowel at its insertion. The tip of the diverticulum contained an undigested fragment of peanut. The pathologist reported heterotopic gastric mucosa in the diverticulum and no evidence of acute inflammation.

This patient made an uneventful recovery and left the hospital on the thirteenth postoperative day. One month after operation his bowel habit was regular and he was free of pain. A gastrointestinal series revealed a normal flow of barium through the small bowel.

#### COMMENT

Operations on Meckel's diverticulum are usually performed for the complications that so frequently accompany its presence. Obstructive bands; bleeding; mass effect or intermittent ulceration; localized peritonitis; strangulation producing gangrenous volvulus; malignant lesion; and carcinoma; giving rise to intussusception, perforation, and hemorrhage; foreign bodies; and jejunal fistulas have all been reported and operated on. In the absence of such complications the so-called ileal diverticulum generally remain in the patient's abdomen as a harmless pouch of small bowel and may be detected for the first time at routine postmortem examination.

The apparently normal Meckel's diverticulum discovered when operating for other disease should not, however, be left in the abdomen. In addition to the threat of complications the diverticulum may without any complication or inflammation, act as a receptacle for food, other particles, barium, and produce symptoms of retention. This clinical picture is well known in the case of esophageal diverticula but it is seldom thought of in connection with Meckel's diverticulum. The symptoms produced by the noninflamed, retentive type of Meckel's diverticulum are vague abdominal pain after meals, flatulence, and a feeling of fullness after meals. This is the only type of Meckel's diverticulum which can be demonstrated roentgenographically. In order to be visualized the diverticulum must have a small opening; otherwise it will empty too readily. If on the other hand, the opening is too narrow it

may be closed off by inflammation and the diverticulum will not fill at all. In the patient reported here as well as in several others in whom a pathologic examination of the diverticulum was made no infiltration of inflammatory cells such as is seen in acute appendicitis was found in the walls of the diverticulum.

Even when Meckel's diverticulum is well demonstrated on the roentgenogram it will frequently be mistaken for a loop of small bowel. The appearance of the shadow that leads to the detection of Meckel's diverticulum is rather characteristic. The following varieties have been observed (1) the snake head type having a pear shaped "head" with a narrow constriction at the "neck," or a long thin "head" with wide constriction at the "neck" (2, 6), (2) the glove finger type which is a uniformly thick usually curved protrusion that shows no constriction (17) and (3) the cherry on a stalk type which has a long constriction near the tip with the lumen narrowed down to a thin line and a heavy well-outlined bulbous tip (4). It is characteristic for all three types to show an angulation of the small intestine at the base of insertion of the diverticulum, in addition the tip or "head" will always point downward.

Numerous suggestions have been made as to the best way to demonstrate this anomaly. These include taking all roentgenograms with the patient in the supine and prone position and creating a continuous flow of barium by administering repeated small doses of a barium-water mixture (16). Retrograde demonstration by barium enema has been recommended if the ileocecal valve is patent (5). Butler et al (17) recently noted the more frequent visualization of normal appendixes with the use of sodium carboxymethyl cellulose as a suspending agent for barium sulfate. This may be helpful in visualizing Meckel's diverticulum as well. Be that as it may the anatomic structure and position of the diverticulum will probably still determine whether it will by its ability to retain barium, be demonstrated or not. With a more careful study of the small intestine and the knowledge of its roentgenographic appearance more diverticula should be diagnosed.



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# A Maxillomandibular Relationship Detector

Pierre O. Evans, *Lieutenant Colonel, DC, U. S. A.* (1)

THE device described herein is not a panacea for the establishment of horizontal and vertical maxillomandibular relationship in full denture prosthesis but rather is an aid to the existing measurement technics. It uses the central bearing-point screw for the maintenance of the final determined vertical dimension and for scribing the intraoral Gothic development of centric relation and giving an extraoral visualization of this measurement.

The *advantages* offered by this type of device are

1 The recording plate does not have to be drilled or indented to indicate the centric point thereby reducing the need for frequent replacement of these plates

2 The patient's voluntary return to centric relation is easily checked extraorally without heavier displacing apparatus such as is found in other intra-extra-oral recorders

3 A constant extraoral visual check is maintained during the entire set of the plaster check bite which obviates any chance of the patient slipping from centric relation.

4 The apparatus (fig. 1) can be assembled easily is inexpensive and consists of (1) 2 flashlight batteries wired and soldered in series, (2) a flashlight bulb or comparable lamp (3) a box with a removable plastic or glass front to contain the batteries and bulb (4) 2 wire leads with nipples for attachment to the central bearing point and recording plate and (5) 2 stiff metal plates cut in arch forms with narrow extension arms 2 or more inches long these arms being bent on themselves at the end and drilled so as to receive the wire nipples (One plate is drilled through the center and a nut is soldered over it the corresponding bolt or bearing point being about 1 inch long and tapered to a fine round point.)

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(1) Madigan Army Hospital Tacoma, Wash.

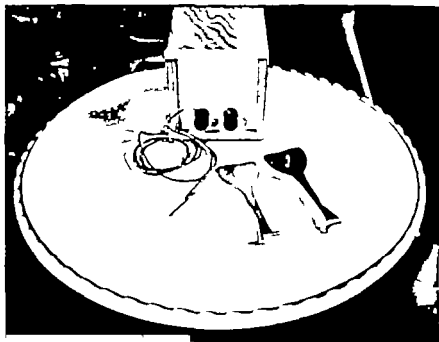


Figure 1.

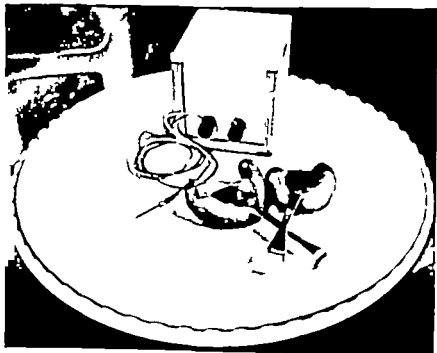


Figure 2.

The *technic* for using this device after vertical dimension has been determined and the wax occlusal contour rims have been trimmed to that dimension is as follows

1 The metal plate on which the tracing will be recorded is waxed into the upper rim so that its surface is horizontal and nearly flush with the occlusal plane. The extension arm is placed so that it is on one side of the midline to prevent later interference with the incisal pin of the articulator in mounting the occluded casts on the articulator.

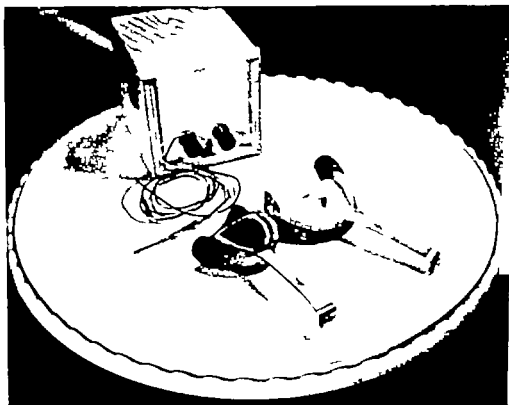


Figure 3.

2 The plate containing the bearing point screw is waxed into the lower contour rim at least 2 mm. below the established occlusal plane in such a fashion that the point is centrally located in the arch, or about equidistant from the cuspid areas on one side to the retromolar pads on the other side. The lower extension arm is also placed to one side of the midline so as to match the position of the arm on the upper rim (fig. 2). Parallelism of the arms in a horizontal plane when placed in the mouth indicates the same relationship of the recording plate and scribing point intraorally.

3 The bearing point is adjusted to the recording plate so that the occlusal contour rims remain in slight contact. From 1 to 2 mm. of wax are removed from the lower contour rim to obviate interference of

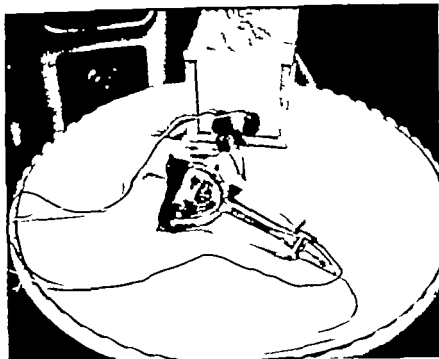


Figure 4.

movement in the excursions of the jaw. The upper rim is not trimmed because it indicates the angle and length of the upper teeth.

4. With the vertical dimension maintained solely by virtue of the central bearing point, the rims having been inserted, the patient is instructed to move into protrusive, right and left lateral excursions returning to a central position between each movement and keeping the bearing point and recording plate in contact throughout. After doing this several times until the operator is satisfied that the posterior triangular portion of the mandibular envelope of movements is being accomplished sharply with minimum of strain by the patient, the rim containing the recording plate is removed and smoked by holding it over a small pledget of cotton that has been soaked in eugenol and ignited. The rim is returned to the mouth and the patient again goes through the three prime mandibular excursions. From these movements a Gothic arch or type of arrowhead tracing will be developed. At the apex or trisection of the developed lines is the centric relation point of the mandible to the maxillas (Fig. 3).

5. The portion of the recording plate not involved in the tracing is wiped free of the oily smoke and a 1/16-inch acrylic resin shim with hole just large enough to accommodate the tip of the central bearing point is placed so that the hole is over thecribed centric point. This

shim is waxed to that position with sticky wax and the rim returned to the mouth (fig. 4).

6 The patient is told to close lightly into contact with his back teeth. Lead wires from the detector box are inserted into the extension arm. If the bearing point entered the shim hole metal to metal contact results in the bulb in the detector box lighting (fig. 5). Plaster is introduced between the plates locking them in centric position.

Holding continuously into centric relation and established vertical dimension will keep the light illuminated. This is important during the plaster check period in which any deviation by the mandible from the recorded measurements will be reflected unfavorably in either the trial setup of the teeth or in the finished dentures.

### CONCLUSIONS

From a psychologic viewpoint, this device stimulates the interest of the patient by making him a participant in the construction of his dentures. For the physically or mentally ill patient whose cooperation is poor the presence of a definite visual goal stimulates greater cooperation with the dentist. From the operator's point of view the detector light cuts out one more blind approach to final measurement of horizontal and vertical measurement and aids in the definite control of the



Figure 1.

mandible in establishing and maintaining these dimensions. In addition a centric point can be established and easily held in the edentulous patient who because of traumatic injury previous malocclusion, or lack of cooperation, cannot accurately control or easily repeat his mandibular excursions. This technic has been used in the construction of over 150 dentures. In no case has it been necessary to remake or reset teeth because of an incorrect maxillomandibular registration.

# Combat Exhaustion<sup>(1)</sup>

Albert J. Glass Colonel, MC, U. S. A. (2)

**T**HE TERM combat exhaustion is applied to the well known acute psychiatric battle casualty to designate a temporary psychologic failure of the soldier to function adequately in a combat situation. The manifestations of combat exhaustion are diffuse and may involve both the psychic and somatic spheres. Characteristically the signs and symptoms are quite variable. The clinical findings may change in a matter of hours or from day to day. In many patients they are mild as exemplified by those persons who only verbalize the subjective sensations of fear in battle with no objective evidence of anxiety. In others tearfulness, depression, gross tremulousness, or hysterical blindness or paralysis may occur. A smaller group of patients exhibit such a severe disruption of personality function that they are out of contact with their environment and present a transient psychotic syndrome.

The acute mental breakdown of combat is an age-old phenomenon. Even the Bible records the panic and paralyzing fright of participants in battle. It has always been considered good military strategy to weaken and disorganize the enemy by using the crippling effects of fear stimuli. The use of bagles, cymbals, and whistles as currently employed by the Chinese troops is an ancient maneuver of this type. Indeed, the walls of Jericho were figuratively at least disintegrated by the blowing of trumpets. In modern warfare artillery fire and air attacks are the most prolific producers of fear as well as actual battle casualties. It is an old military axiom that one never wastes artillery shells so long as they are hurled at the enemy. Even animals use fear producing tactics as exemplified by the roaring of the lion which renders the victim helpless before the actual attack.

It is evident that any method designed to increase the strength and number of fearful stimuli may serve to undermine the ability of persons to react aggressively to a source of danger. This occurs because the subjective sensations of fear are never helpful to the person but are painful. They make it difficult for him to think logically and operate

(1) Adapted from paper published in the Surgeon Circular Letter, Jan. 1951.

(2) Psychiatrist, Consultant, General Headquarters, Far East Command.



to inhibit physical activity. Only the physiologic concomitant of fear are valuable in that they prepare and support the soldier for the increased bodily demands required for fight or flight.

The emotional overtones inherent in the words used to label the combat psychiatric casualty are of major importance. They affect the attitude of the patient towards his condition as well as influence the opinion of his fellow soldiers, friends, and family. Prior to the advent of modern medicine, the emotional upheaval in battle was designated by lay terminology indicative of paralyzing fear or flight with the moral connotation of cowardice.

Only since World War I has military medicine been called upon both to prevent and treat psychiatric casualties in an effort better to conserve the fighting strength. Because the greatest fear and casualty-producing agent was artillery fire, mental breakdown in battle became known as shell-shock. This term, although descriptive, was unfortunate because it produced confusion and unclear thinking on the part of the patient and the physician. Medical officers debated amongst themselves as to the amount of brain damage present because of the inevitable history of a nearby explosion. Patients were easily influenced to believe then, as today, that their symptoms were logical result of an outside force which caused irreparable injury to the mind. They readily took the view which removed personal responsibility for an emotional conflict. The entire syndrome was fostered and fixated by prolonged hospitalization with subsequent evacuation to the zone of the interior. Following World War I it became generally recognized that shell shock was primarily a psychologic problem, and that the effect of air blast on the head could not explain most of the immediate symptoms and all of the later persistent ones.

At the outset of World War II, the pendulum had swung completely to the view that the emotional disruption occurring in battle was an acute traumatic neurosis and should be classified accordingly. As a result in the early phases of World War II, psychiatric casualties were designated as psychoneurosis, anxiety state, anxiety reaction, psychoneurosis mixed, conversion hysteria, et cetera. This nomenclature like shell shock, proved to be misleading to the medical officers and traumatic to the patient. It unnecessarily conferred the diagnosis of fixed neurotic disease on fluid and transient emotional disorder. Again, it influenced the psychiatric casualty to believe he was suffering from a serious mental illness for which there was a poor prognosis and in which he could readily use the mechanism of secondary gain to transfer responsibility for his symptoms and behavior to the workings of his unconscious mind.

A new diagnostic category was needed. In 1943, the designation combat exhaustion was originated to convey a more realistic appreciation of a transient psychologic breakdown caused by battle stress, which might occur in persons with or without neurotic predisposition.

The word exhaustion gave the connotation of a logical result of combat from which one can recover by such ordinary means as rest and recuperation. This diagnosis quickly became popular and was adopted by all branches of the service with such modifications as combat fatigue, flying fatigue and 'operational fatigue.

After the initial confusion of the Korean campaign, combat exhaustion became the standard diagnosis to categorize the acute psychiatric casualty among divisional or other troops in the forward areas but other definitions have already begun to creep in and distort the original meaning of the term. On the one hand, some have reverted to the past and regard combat exhaustion as a fancy name for being cowardly or yellow; on the other, it has become confused with physical exhaustion and considered an organic disease. My purpose in this article is to clarify the concept of combat exhaustion and to explain its complex cause which may include physical factors. It is hoped that a better understanding of the problem will point to logical methods of prevention and early treatment which are essential to conserve the fighting strength of our troops.

It has been stressed that the instinctive fear of the loss of one's life is the primary or basic cause of combat exhaustion. This is too simplified a concept and is similar to considering that the tubercle bacillus is the cause of active tuberculosis. As in tuberculosis, it should be recognized that there are multiple causative factors such as the amount and intensity of the dosage of the traumatic agent, and the lowering of sustaining powers against illness called resistance. These are of far more importance in producing the clinical disease than the ubiquitous fear of death in battle which, like the germ of tuberculosis, is present in almost everyone.

When attention is shifted from the threat to life as the major cause of combat exhaustion to an examination of individual susceptibility and the sustaining powers which prevent fear from overwhelming the person, a new way is open for a more fruitful understanding of the entire problem. In considering individual susceptibility to emotional breakdown, it must be conceded that all persons do not have the same capacity of adjustment to stressful situations. In combat, it is particularly necessary that the soldier be able to mobilize and externalize aggression, in order adequately to cope with the enemy. The timid, passive person who has never had a fight and who rarely fires his rifle is especially vulnerable to fear because he is unable to discharge tension by hostile action. Consequently, anxiety builds up rapidly and becomes uncontrollable. To a lesser degree, the overly careful or overly aggressive soldier is more susceptible to combat stress because such character traits have been developed as a protection against excessive inner feelings of insecurity and dependency. Continuous combat produces a collapse of the soldier's hitherto effective defenses with the consequent rise of unbearable tension.

Another component of the personality which contributes to the adjustment of the combat soldier is the conscience. This is that well-known internal policeman that forces one to perform unpleasant, distasteful, and even dangerous tasks, because of duty, honor, self-esteem, and self-respect. Persons with an average degree of conscience are internally compelled to keep going on in battle despite terror and a wish to flee or be helpless. Self-esteem is a potent force in human behavior and is deeply ingrained in our western population. It is responsible for the phrase "I have to live with myself." If the strength of the conscience is low, the soldier lacks an internal compelling agent and more readily allows himself to be overcome by external stress. If the conscience is overly severe, it punishes the person for even the unavoidable disastrous episodes so common in battle. This reaction is frequently observed in officers and noncommissioned officers who blame themselves for the normal victories and casualties among their men, despite the intellectual knowledge that such events are inevitable in combat. This feeling of guilt adds a further burden to the existing tension and may precipitate a mental breakdown.

The omnipresent fear of death and the individual susceptibility to combat stress are not sufficient to explain the causation in most patients with combat exhaustion. It is common knowledge that some combat units consistently have fewer psychiatric casualties than others, despite an equivalent or greater degree of battle stress. This discrepancy in psychiatric rates can be observed among the various units of a battalion, regiment, or division. The distribution of vulnerable persons is similar in all organizations and does not explain the disproportionate incidence of psychiatric breakdown. Another factor must be present namely the influence of the group or combat unit which can offer real protection against external fear. The soldier does not fight alone--around him are his buddies who share his dangers and deprivation and will aid him if he is disabled. The more confidence he has in his platoon or company the less fearful is the battle situation. When men fight together and share common tribulations, they become bound by the closest of emotional ties. This affection, which is akin to love, serves to lessen concern for one's own life, thereby decreasing the crippling subjective sensation of fear. That such an emotional bond is common has been demonstrated by numerous instances in which soldiers have unhesitatingly performed dangerous and heroic deeds to save their friends. The grief reaction of a man who loses a buddy in combat is only comparable to the mourning over the loss of a loved one. The close kinship of men forged in battle is responsible for instances in which soldiers prematurely leave the hospital or rear assignment to rejoin their comrades.

Group identification begins in training. Here the soldier gains not only competence and confidence in the use of his weapon but also learns the value of teamwork in battle. The foundation for the protective functioning of the unit. If additional training is given to replace

ments by the combat unit, this serves rapidly and effectively to integrate them into the group. Such a training policy has been successfully adopted by divisional units in Korea when the tactical situation permitted. This acts as an added environmental support often needed by susceptible persons to prevent an early breakdown in battle.

Even the timid soldier comes to feel secure by being in a powerful group and often assumes the aggressive attitude of the organization. The unwilling person with little internal compulsion for hazardous duty is literally forced to adopt the higher standards demanded by his fellow-soldiers. The combat unit develops its own special characteristics which are quickly adopted by the replacement and after a short time he talks and acts like any veteran member. In brief the group offers protection against fear to the soldier and provides for his emotional needs but demands that he give up personal desires and selfish considerations. In its simplest form, group identification is a matter of "united we stand divided we fall."

The ability of a combat unit to achieve tactical success and to sustain its constituents against emotional breakdown depends entirely on its leader. Napoleon's dictum "there are no bad soldiers only bad officers," points to the crux of the problem of morale and combat effectiveness. Because the company-grade officer lives in intimate contact with his men he plays a vital role in their motivation and group spirit, and is figuratively and literally a father figure. Like a good father he cannot be over-indulgent, but he must have a personal concern for the comfort and welfare of his men. Such a leader sets the standard and motivation for his organization by example and behavior. The poor combat leader is quickly recognized by his men for inept tactical management, unfair treatment, and a callous disregard for their comfort and safety.

A member of an adequately led combat unit has an increased resistance to mental breakdown because of the emotional and actual support provided by the group. The failure of such an environmental support is the major cause for most cases of combat exhaustion. It explains the difference in psychiatric rates for various units but there are exceptions even in a well led combat unit when unavoidable battle episodes occur and heavy casualties are suffered. The protection of the group is suddenly weakened or destroyed. It is at such times that combat exhaustion may occur in the more susceptible members of the unit if they are left to face their danger alone. There are also occasions when the death or other removal of a combat commander may cause a disruption of the group with consequent mental breakdowns especially if a new leader, a platoon sergeant for example, does not arise promptly to assume command.

A minor but pertinent cause of combat exhaustion is a lowering of the physiologic state of the body. This occurs when men go without food and sleep for many days or become afflicted with such intercur-

rent diseases as malaria, diarrhea, or hepatitis. A decrease in physical ability to function adequately makes it difficult for the soldier to continue his aggressive adaptation and to control subjective sensations of fear. If not corrected, it may operate as "the straw that broke the camel's back" in its action as a precipitating agent to produce combat exhaustion. Unit commanders are well aware of this problem and attempt to insure periodic rest from combat with an opportunity to obtain hot food and sleep. Often the unit commander and the battalion surgeon act together to give certain soldiers a 24-hour rest period at the aid station or some other suitable location.

The prevention of combat exhaustion must lie in the province of command. The medical officer has no inoculation against the virus of fear. Moreover it is impossible to select only mature aggressive and well-motivated men for combat duty. The measures that will sustain the soldier from an emotional breakdown are identical with those required for a good tactical unit. The selection of capable combat leaders and the initiation and maintenance of group morale and motivation are the logical and profitable means of preventing the soldier from being overcome by battle stress.

The prevention of psychiatric casualties is a relatively simple process compared to treatment after the soldier has suffered a mental breakdown. This can be accomplished effectively and rapidly when the causes of combat exhaustion are understood and if there is a proper appreciation of the role played by the primary and secondary gain in illness. The primary gain in illness is readily recognized when one considers that sickness confers a gain of being helpless with an honorable reason for not fulfilling adult obligations. This explains the euphoria of soldiers who receive a minor battle wound. It accounts for the phrase million dollar wound which, in effect, places the soldier in a privileged status of being unavoidably removed from the difficult and dangerous job of a combat soldier. It is only after recovery from such a wound, when the soldier is ready for discharge from the hospital, that tension and anxiety appear coincident with the removal of the advantages of illness. Any type of disease may provide an element of primary gain for the patient. This is equally true in civil life where sickness is the best excuse for enjoining away from work or onerous task. A primary gain from illness is also achieved by the psychiatric casualty. Hysterical blindness or paralysis on the battle field duplicate disabling conditions and force removal from the stressful situation. In patients suffering from wounds disease and most of those with combat exhaustion, the primary gain is unconscious and not directly sought but when the soldier uses the same symptomatology to avoid return to combat or to prevent reassignment to noncombatant duty we note the phenomenon of the secondary gain in illness. It is an attempt by the person to retain his patient status by using pattern similar to that which produced the primary gain. This is demonstrated by the wounded soldier who on recovery continues to have pain about

the site of injury or operation and the psychiatric casualty who maintains his tremor headache and tension even though far removed from battle. The longer the patient remains away from his unit, in time and distance the more vulnerable he becomes to the fixation of secondary gain. He is removed from the sustaining influence of his organization and is no longer motivated by their attitude and standards.

The awareness of the factors of time and distance in the gain in illness mechanism can be effectively used in the treatment of combat exhaustion, particularly if that illness is viewed as a temporary disruption of the protective powers of the group or a lowering of resistance of combat stress by physical factors. In practice the acute psychiatric casualty is readily salvaged if after a period of relief from mental and physical stress he is promptly returned to his organization. This return contains the emotional support required to aid him in resuming his previous self control. A treatment program which involves a 2 to 4-hour period of rest and rehabilitation within the division area has the advantage of keeping the patient near his group where time and distance are not sufficient to permit the transition from primary gain into chronic secondary gain. Patients with severe combat exhaustion, however must be evacuated to rearward hospitals and given a more prolonged relief from battle. This is especially true when they have been in combat for many months and have lost most of the members of their original group. At this rearward level of treatment it is sound treatment to return the patient to some useful noncombatant job as soon as possible in order to circumvent the buildup of symptoms of secondary gain and to give the soldier an opportunity to feel that he is still an effective member of the Army. After several months of a rearward assignment, the former combat soldier often is ready to return to his original organization. Even the patients with the most serious exhaustion who are evacuated to Japan are salvaged for effective noncombatant duty by psychotherapy. In this form of treatment it is instilled into the patient that what has happened to him is a rational and logical series of events, that he cannot cling to the helpless state that originated in battle and that the overcoming of the neurotic mechanism is imperative to prevent a fixation of symptoms which would occur if he were returned to the zone of the interior. Such further evacuation tends to place an additional burden on the patient in that he must continue to have symptoms in order to explain to himself his friends and family the reasons for his failure. If the pattern of secondary gain is repeated often enough, he is rendered helpless for subsequent useful activity and there is produced the well known querulous irritable neurotic war veteran.

What has been stated above in regard to the prevention and treatment of combat exhaustion can be applied with equal force to the emotional breakdowns in noncombatant units whether they be located overseas or in the zone of the interior. The factor of group identification which sustains a person against the deprivations and vicissitudes of

the environment operates in an identical manner in noncombatant organizations. Here also leadership is important in the maintenance of unit morale. Similarly the treatment of psychiatric patients from non-combatant units should be based on the principle of treatment near the location of origin thus limiting the gain in illness.

#### SUMMARY

Combat exhaustion results from several factors the most important of which is a decrease in the environmental support provided by the group or combat unit, permitting the soldier to be overwhelmed by external danger. The recognition of this concept facilitates a more rational application of the methods that can be employed in the prevention and treatment of this disorder.

# The Effect of Confinement on Psychiatric Patients<sup>1</sup>

John R. Cavanagh, *Commander MC, U.S.N.R.*

**T**he Manual of the Medical Department of the United States Navy (paragraph 3326) requires that a Board of Medical Survey insert the following sentence in all its reports on patients in whom disciplinary action is pending: 'It is the opinion of the Board that disciplinary action is (not) likely to have a deleterious effect on his mental or physical health. The medical officer confronted with the need for making such a statement is frequently in a quandary in that he may have had little experience on which to base this statement.

A survey of the effect of confinement on patients with a psychiatric diagnosis was made at the U. S. Naval Disciplinary Barracks from 1 April 1948 to 1 April 1949. During that time 1,694 confinees were received. There was an average daily census of 691 with an average monthly admission rate of 81. During that year 112 confinees, 6.6 per cent of the total population, had psychiatric diagnoses. Of this number 47 diagnoses were established before arrival at the institution and 65 were established after arrival as a result of the initial psychiatric interview. Although those confined for scandalous conduct were included in this group as psychiatric cases, there is doubt in many cases whether or not a psychiatric diagnosis was justified.

## DESCRIPTION OF THE STUDY

In attempting to find some basis for comparison between the psychiatric group and the nonpsychiatric group, it was believed that the most objective method of evaluation would be on the basis of the work record and conduct record of the confinee. A more subjective method was the evaluation by the psychiatrists and other qualified members of the staff who saw the patients during this year of observation. In averaging the work reports, each work report grade was given a weighted score. These figures were then added algebraically and an average was obtained. For this purpose the following weighted scores were used: Excellent +2, Good +1, Fair 1, Poor 2.

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<sup>1</sup>From the U. S. Naval Disciplinary Barracks, Portsmouth, N. H.



## RESULTS

*Psychoses.* Eleven psychotic patients were detected during the year of this study. These were discovered early during the time of confinement and there were indications that the psychosis was present prior to admission to the disciplinary barracks. Most of them were discovered during the quarantine period. Eight had schizophrenia, 2 had psychoses with constitutional psychopathic inferiority, and 1 psychosis unclassified. These constituted only 0.6 percent of the total population of the barracks—much lower rate than for civil society or the military service as a whole. One man had previous treatment at the United States Naval Medical Unit, Fort Worth, Tex. None of the other patients had been previously hospitalized as psychotic. As soon as a diagnosis of psychosis was established the patient was transferred to a hospital equipped for the treatment of psychotic patients. This was also considered a desirable measure when the patient was thought to be prepsychotic.

*Personality disorders.* The diagnosis of a personality disorder was noted in the health record of 10 men prior to their arrival and was established in 30 men at the screening examination made at the disciplinary barracks. Almost without exception, these men made a satisfactory adjustment to confinement. Their work record was above average and their involvement in disciplinary difficulties was substantially the same as for the normal group (0.81 as compared to 0.77). These men were not seen oftener at sick call than the average inmate. A small number of this group tended to react more strongly than the average to lack of new or distressing news from home, but this tendency was not outstanding. In only 1 man of this group would it appear that confinement induced an aggravation of his condition. On 3 occasions during the year as a result of news from home which indicated that his wife was being unfaithful to him, he became recalcitrant, threatened to escape, and became violently assaultive for short periods which were followed by restlessness, insomnia, and anorexia. With a minimum of psychiatric care, however, he returned to work and when last seen was making good adjustment to confinement and was considered an excellent worker.

*Constitutional psychopathic inferiority.* The diagnosis of constitutional psychopathic inferiority was established in 13 cases before the man was sent to the disciplinary barracks. It was established in 16 cases at the screening examinations at the barracks. There was a marked discrepancy in both the work and disciplinary record of these two groups. This difference probably arose from the fact that the psychiatric staff of the disciplinary barracks had (1) more rigid criteria for this diagnosis, (2) a better chance for observation of the man, and (3) complete records of the confinee's past history. In both groups the disciplinary record was poor. The group of patients who were diagnosed at the disciplinary barracks had good work record. The good work record should be credited to the sincere effort of the Classification Board to

find the job for which each man was best suited. The psychopath did not constitute a serious problem and adjusted to confinement.

*Mental defectives.* This diagnosis was made in 1 patient prior to admission and in 3 as a result of the screening examinations. One patient was sent to the United States Naval Hospital Chelsea, Mass. for disposition because his deficiency was considered serious enough to impair his legal responsibility. The other 3 were retained in the disciplinary barracks.

*Epilepsy.* One patient with epilepsy was detected during the year. He was referred to a naval hospital for appearance before the Board of Medical Survey.

*Psychoneurosis.* The diagnosis of psychoneurosis was made only once during the year of study. This was a conversion hysteria which was present in a naval offender who felt that he was unjustly confined. He developed a rigidity in one of his legs after a rather trivial injury to it. All efforts to treat this patient in the disciplinary barracks were fruitless. He was transferred to a naval hospital where psychotic manifestations later developed.

*Scandalous conduct.* Except for the 3 men whose diagnosis of scandalous conduct was made after admission to the disciplinary barracks, the work and conduct records of this group was above average. These men were working and living together in a special detail, the nature of which was known to the other prisoners and duty personnel. It constituted, therefore, a group to which everyone was somewhat sensitized. For this reason, a good work record has added significance. The 3 men who were diagnosed after admission to the disciplinary barracks received this classification because of overt homosexual acts committed within the prison. The work record of this group often suffered because of their resentment at being segregated. Disciplinary infractions in the group were at a minimum because they were placed under a small detail of mature, especially trained guards. Prisoners who were confined on a scandalous conduct charge were usually not homosexuals in the true sense of the word. They were men who had been guilty of homosexual acts either while drunk or when deprived of female companionship. Actually in most cases their preference was for heterosexual associations.

*Control group.* A group of 100 prisoners of similar age, military experience, and disciplinary status was selected at random for comparison with confinees with psychiatric diagnoses. The control group was confined to the institution during the same year and for about the same length of time. The average work record for this group was not as good as that of the psychiatric group, being +1 as compared to an average of +1.39 for the group with personality disorders and +1.22 in one group of psychopaths. The average number of times on report for the nonpsychi-

atic group was 0.77 as compared to an average of 0.41 for the psychiatric patients.

### SUMMARY

Emotional outbursts are common in men during confinement. It is important that the psychiatrist in a disciplinary barracks have sufficient experience to recognize the temporary nature of these outbursts and to enlist the cooperation of the staff in their early detection. By detecting the unrest and potential "blowing of the top" the psychiatrist can institute corrective measures and thus save the man from becoming involved in further disciplinary action. Prevention in cases of this sort is one of the primary functions of the psychiatrist.

Although this sample is relatively small, it would appear that the adjustment of the psychiatric patients to confinement was as good, if not better, than that of the control group. The psychopaths did not make a good adjustment to confinement as did the group with personality disorders. This is understandable from the nature of their disability. The psychopath apparently accepts the inevitable when he is confined. He is not a serious source of disturbance within the institution and has only occasional periods of excitement. The commanding officer and all members of the staff of the institution at which these studies were made were cooperative and they understood the needs of the emotionally disturbed inmate. This facilitated the excellent adjustment of these men to their confinement.

### CONCLUSIONS

Prepsychotic and psychotic patients should be transferred to a hospital and not retained in a disciplinary barracks. Persons with personality disorders tolerate confinement well. Psychopaths are not a problem if they are treated individually by a classification board. The orientation of the command to problems of psychiatry is an important factor in the good adjustment of psychiatric patients to confinement.

# Malayan Filariasis

## Incidence and Distribution in Southern Korea

Takashi Senoo, M. D. (1)

David R. Lincicome, Major MSCR, U. S. A. (2)

THE investigation on which this report is based was made during the years 1942-1944 by the senior author under the leadership of Professor Harujiro Kobayashi. At the invitation of the latter, the junior author has undertaken the task of correlating and preparing the results for publication. This report constitutes the second of 2 communications on filariasis in Korea. In the first (3) it was reported that about 5 000 patients had been examined in Southern Korea and Quelpart Island for filariasis and that 604 of these were positive for microfilarias of the species *Wuchereria malayi*. This report is concerned with an analysis of the incidence and distribution of *W. malayi* as observed in Southern Korea.

### PROCEDURES

Twenty-one small villages randomly selected from 5 general areas in the southern portion of the Korean peninsula and 4 villages on Quelpart Island were chosen for study. All villages with the exception of those on Quelpart Island were impartially selected without regard for endemicity of the disease. Endemicity of elephantiasis on Quelpart Island had previously been reported (4) as considerable in several villages along the coast, although the cause was not known. Members of the population in each village were chosen without regard to age, sex, condition, or whether they had then or previously a history of elephantiasis. Blood collections were made at night between 2000 hours and midnight. Blood smears were prepared for study and identification of microfilarias as described in the first communication.

(1) Kasumigaura National Hospital, Truchifera, Japan.

(2) Newark, Del.

(3) Senoo, T. and Lincicome, D. R.: The prevalence of Malayan filariasis in Korea. *Trans Roy Soc Trop Med. & Hyg.* (In press.)

(4) Bua, J. C. Study of endemic elephantiasis in Korea. II. Survey results in Salakha Island. *J. Chosen M. A.* 20 (8): 1426-1442, 1939.

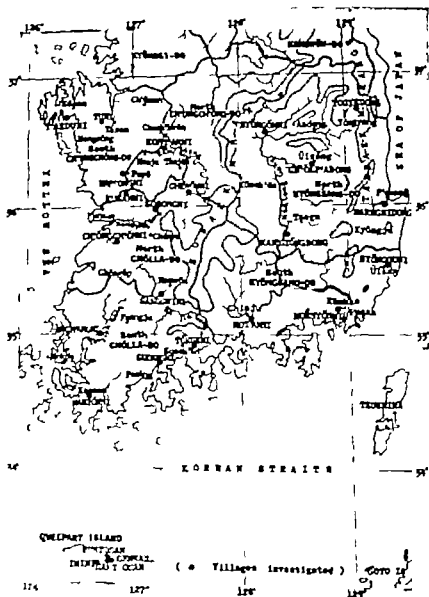


Figure 1 Map of Southern Korea and Quelpart Island.

## PRESENTATION OF DATA

The geographic distribution of villages examined is shown in figure 1. The incidence of *W. malayi* on Quelpart Island is presented in table 1 in the southwestern part of the southern portion of the Korean peninsula in table 2 and in the southeastern section in table 3. The distribution of *W. malayi* by age groups and sex for Quelpart Island is shown in table 4 and for the Korean mainland in table 5.

## DISCUSSION

The present study has revealed a high incidence of infection with *Wuchereria malayi* on the island of Quelpart off the southern tip of the Korean peninsula. The incidence of 26.6 percent in the 971 persons examined is well above that found for any other section of Southern Korea. The area beginning at Byongomni in North Kyongsang-Do and extending to Saengsidong on the east coast near Pohang and Kangyongdong southward to the Pusan area is not so heavily infected particularly in the area of the port of Pusan. In only one village (Togyedong) in the southeastern section was the incidence comparable to that found on the island of Quelpart.

The rate of infection in the 3 general areas of the southwestern sector was well above the rates observed for the southeastern section but was about half that for Quelpart Island. There was an apparent decline in incidence extending from the northern most area of South Ch'ungch'ong-Do to the extreme tip of the peninsula in South Ch'olla-Do. This is more readily appreciable when the range of incidence figures is studied and compared in each of the 3 main areas of this section.

Study of the distribution of *W. malayi* between the sexes reveals differences which may in part be explained on the basis of work habits rather than sex. On Quelpart Island where the women work in the fields as much or more than the men (4) the incidence of *W. malayi* was practically equal. In the southeastern section where there is a fairly low general level of incidence there was a higher rate of infection in men than in women. Presumably here the men do more work in the fields and thus are more exposed to the bites of mosquitoes than the women. This difference is not apparent in the southwestern section where the general incidence was twice as great as in the southeastern part.

The general differences in sex distribution were carried over when incidence data were arranged along age lines. On Quelpart Island there was relatively little difference in incidence in either sex regardless of the age bracket. On the mainland, however there appeared to be a prominent disparity between the sexes after the age of 20.

TABLE L. Incidence of *Escherichia* malayii on Quartermaster Island

Vll A	Number of person examined			Number positive for microorganisms			Incidence (percent)		
	Total	Mal	Female	Total	Mal	Female	Total	M	Female
Native to the	248	190	128	80	41	39	31	31.5	30.5
Seawater	133	62	1	23	11	12	17.3	17.7	16.9
Public on	133	85	48	4	3	1	3	3.5	2.1
Animal	447	308	139	151	100	51	33.8	32.5	36.7
Total	971	585	386	238	155	103	26.6	26.5	26.7

TABLE 2 Incidence of *Bucheria malayi* in Southwestern Korea

Village	Number of persons examined			Number positive for microfilariae			Incidence (percent)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
<b>South Ch'ungch'ong-Do area</b>									
Anch'angni	102	58	44	76	17	9	25.5	29.3	0.4
T'ungni	263	144	139	53	28	25	18.7	19.5	18
T'aejund	196	95	101	13	7	6	6.6	7.4	5.9
Hapsongni	310	142	168	45	23	22	14.5	16.2	13.1
Total	871	439	432	137	75	62	15.4	17.1	13.7
<b>North Ch'olla-Do area</b>									
Ch'wobni	191	102	89	26	17	9	13.6	16.7	10.1
Kusanri	155	96	59	19	13	6	12.3	13.5	10.2
Ch'angch'oni	198	104	94	9	5	4	4.5	4.8	4.3
Sangwini	213	116	97	11	6	5	5.2	5.2	5.2
S'obongni	62	45	17	11	7	4	17.7	15.6	23.5
Total	819	463	356	76	48	28	9.3	10.4	7.9
<b>South Ch'olla-Do area</b>									
Anch'angni	214	122	92	26	12	14	12.1	9.8	15.2
Sudanngi	207	101	106	29	13	16	14	12.9	15.1
Namyongni	208	119	89	16	11	5	7.7	9.2	5.0
T'ak'ngi	209	108	101	1	1	0	0.5	0.9	0
Total	838	450	388	72	37	35	8.6	8.2	9
Grand total	2,548	1,352	1,196	285	160	125	11	11.8	10.5



TABLE 3. *I. cridini* / *Wuchereria malayi* in South eastern Korea

Village	Number of persons examined			Number positive for microfilarias			Incidence (percent)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
<b>North Kyŏng province</b>									
Byŏnggŏn	246	133	113	4	1	3	1.6	0.8	2.7
T'ayŏng	204	114	90	55	40	15	27	35.1	16.7
Ch'ŏp'ŏng	182	91	91	0	0	0	0	0	0
Kan Kyŏng	201	107	94	0	0	0	0	0	0
Saŏnŏng	169	79	90	1	1	0	0.6	1.3	0
Total	1,002	524	478	60	42	18	6	8	3.8
<b>South Kyŏng province</b>									
Byŏnggŏn	200	112	88	0	0	0	0	0	0
Hŏnggŏn	200	96	104	1	1	0	0.5	1.1	0
Hŏnggŏn	80	43	37	0	0	0	0	0	0
Total	480	251	229	1	1	0	0.2	0.4	0
Grand total	1,482	775	707	61	43	18	4.1	3.3	2.5

TABLE 4. *Age group and sex distribution of Wuchereria malayi on Quelpart Island (villages of Nam'osan, Seowani and Wimini)*

Age group	Number examined			Number positive for microfilariae			Microfilaria rate (percent)		
	M	F	Total	M	F	Total	M	F	Total
0-10	68	44	112	21	15	36	30.9	34.1	32.1
11-20	197	153	350	66	48	114	33.5	31.4	32.6
21-30	83	40	123	26	12	38	31.3	30.0	30.9
31-40	44	29	73	10	6	16	22.7	20.7	21.9
41-50	44	29	73	11	9	20	25.0	31.0	27.7
51-60	38	29	67	12	10	22	31.6	34.5	32.8
61-80	26	14	40	6	2	8	23.1	14.3	20.0
Total	500	338	838	152	102	254	30.4	30.2	30.3

TABLE 5. *Age group and sex distribution of Wuchereria malayi in Southern Korea (villages of Togyedong, Kopt'anni, Tami, Hapsongni, Chuwonni, Sudangni and Anch'angni)*

Age group	Number examined			Number positive for microfilaria			Microfilaria rate (percent)		
	M	F	Total	M	F	Total	M	F	Total
0-10	244	200	444	13	19	32	5.3	9.5	7.2
11-20	226	183	409	29	18	47	12.8	9.8	11.5
21-30	111	124	235	27	21	48	24.3	16.9	20.4
31-40	112	109	221	36	20	56	32.1	18.3	25.3
41-50	83	92	175	31	18	49	37.3	19.6	28.0
51-60	65	53	118	21	13	34	32.3	24.5	28.8
61-80	38	26	64	6	7	13	15.8	26.9	20.3
Total	879	787	1666	163	116	279	18.5	14.7	16.8

## SUMMARY

Of 5 000 persons from 25 villages in Southern Korea and Quelpart Island examined for filariasis 604 were shown to be infected with *Wuchereria malayi*. The highest incidence of the organism occurred in Quelpart Island, the next highest in the southwestern section, and the lowest in the southeastern area. The organism was equally distributed between the sexes on Quelpart Island and in southwestern Korea; men were more often infected in southeastern Korea.



# The Treatment of Paroxysmal Ventricular Tachycardia With Pronestyl

Charles L. Hamilton Jr. *Captain U S A F (MC) (1)*

Francis W. Wilson, *Lieutenant Colonel, U S A F R (MC) (1)*

**P**ROCAINE is known to be a valuable therapeutic adjunct in the management of certain cardiac arrhythmias but such disadvantages as rapid hydrolysis in the plasma the hypotensive effect, and moderate toxicity detract from its value. Related products have been investigated in the search for a more acceptable therapeutic agent. Mark et al. (2) has reported on the use of the amide of procaine (pronestyl) on ventricular arrhythmias. This was followed by further studies (3-5). From the observations of these workers procaine amide hydrochloride is seemingly of definite value in the treatment of paroxysmal ventricular tachycardia and ectopic ventricular contractions. Kinsman et al. (5) considered it to be of some value in nodal tachycardia and ectopic auricular contractions. It was of no value in the treatment of chronic auricular fibrillation and auricular flutter. Kinsman et al. administered the preparation to 5 normal subjects and observed a slight fall in systolic blood pressure no change in diastolic blood pressure and a slight increase in pulse rate. He also noted slight prolongation of the QRS complex and of the QT interval as well as transient T wave changes which consisted of flattening notching or inversion.

(1) USAF Hospital, Lackland Air Force Base, San Antonio, Tex.

(2) Mark L. C., Bedis, L.; Kay H. J.; Rovinsky, E. A. Steele, J. M., and Brodie, D. D.: Action of procaine amide on Ventricular Arrhythmias. Abstract of paper presented at meeting of the American Society for Pharmacology and Experimental Therapeutics, Indianapolis, Ind. No. 17-19, 1949. *J. Pharmacol. & Exper. Therap.* 98: 21-22, Jan. 1950.

(3) McClellan, E. L.; Stanwood, J. E.; and David, N. A.: Substitute for procaine in ventricular tachycardia. Presented at American Physiology Society Meeting, April 17-21, 1950. *Federation Proc.* 9: 82, Mar. 1950.

(4) Elkin, S. R.: Practical recognition and treatment of cardiac arrhythmias. *Arizona Med.* 7: 21-27, Oct. 1950.

(5) Kinsman, J. M., Clay H. L.; Coe, W. S. and Best, M. M.: Procaine amide (pronestyl) in treatment of disorders of cardiac rhythm. *J. Kentucky State M. A.* 48: 509-511, Nov. 1950.

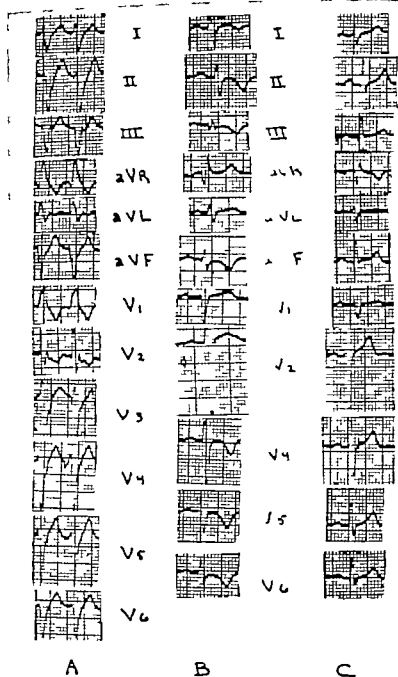


Figure L. Representative portions of ECG tracings. (A) Before treatment. (B) Immediately after therapy with promestyl. (C) Twenty-four hours after treatment.

## CASE REPORT

A 33-year-old man entered the hospital complaining of "rapid heart gaslike sensation of pressure below the heart weakness hunger and moderate prostration which had been present for 23 hours. He had experienced several similar episodes since 1945 which varied in duration from 1 to 24 hours and which were usually associated with periods of environmental stress. The details regarding treatment of previous episodes were not known but the patient thought that sedatives had been used with efficacy in the past.

Physical examination revealed an apprehensive man of stocky body build who was not in acute distress. The skin was flushed and moist. The blood pressure was 80/60 and the heart rate was 170. An ECG obtained at this time (fig. 1A) revealed a ventricular tachycardia originating from a single focus in the left ventricle.

Carotid sinus pressure failed to alter the rate or character of the ECG. A single oral dose of 0.1 gram of quinidine sulfate was administered and apparently well tolerated. Following this 0.4 gram was administered at 2-hour intervals for a total of 3 doses. Shortly after ingestion of the third dose the patient became moderately dyspneic and orthopneic. The respiratory rate was 40 and the pulse and apical rate 150. There was cyanosis of the lips and nail beds. The venous pressure was not clinically elevated; there was slight pitting edema in the lumbosacral area. The blood pressure was still 80/60 and scattered crepitant rales were audible in both posterior lung fields.

The patient was placed in an oxygen tent and the cyanosis disappeared rapidly as did the obvious respiratory distress. Twenty cubic centimeters of a 10 percent magnesium sulfate solution was given intravenously to depress the myocardium. Depression so induced is not selective for heart muscle. Presumably as a result of giving this agent the apex rate decreased from 150 to 120. Following this 0.6 gram of quinidine was given by mouth at 2-hour intervals for 2 doses. Eight hours later and 36 hours after the onset of the paroxysmal ventricular tachycardia the apex rate had gradually increased to about 160. The general appearance of the patient was good; no lumbosacral edema was present and the cyanosis and respiratory distress had cleared up.

A 10 cc ampule of pronestyl hydrochloride containing 1 gram of the procaine amide was diluted with 20 cc of sterile water and injected intravenously at a rate of about 200 mg per minute. During this procedure a continuous ECG was obtained (fig. 2). Progressive widening of the QRS complex and the QT interval with slowing of the ventricular rate to 110 was noted. At the point where 666 mg of pronestyl had been given there was an abrupt restoration of sinus rhythm with an initial rate of 85. At the point of conversion of rhythm the patient stated that he had a strange sensation in his chest but was unable to further qualify this. One month after this medication he had had no further attacks of tachycardia. No maintenance dose of the drug was given.

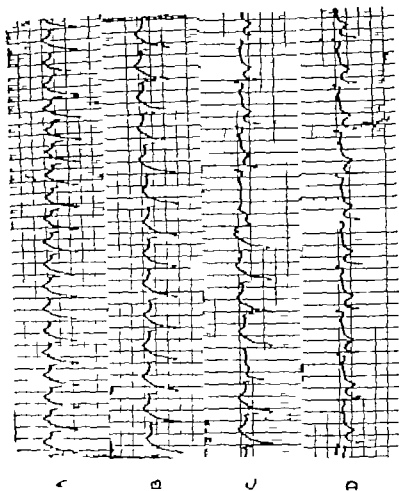


Figure 2. Representative portion of Lead II. (A) During the initiation of treatment. (B) After having injected about 500 mg of verapamil. (C) Shows the abrupt change from premature to late rhythm. (D) Immediately follows the cessation of verapamil.

## DISCUSSION

It is probable that this patient had experienced similar episodes since 1945. His rhythm dramatically converted to a sinus rhythm while he was receiving procaine amide hydrochloride intravenously. Immediately following the rhythm conversion there was slight depression of the ST segment and inversion of the T-wave (fig 1B). The rather striking ST changes immediately following restoration to sinus rhythm persisted for several hours. Although T wave changes of this nature have been reported as a pronestyl effect in this instance it could represent myocardial anoxia secondary to the persistent tachycardia. The right axis deviation, wide S-wave in leads I,  $V_5$  and  $V_6$  with the wide R wave in lead aVR suggest a right intraventricular conduction defect, which may represent pronestyl effect though again anoxia cannot be excluded. Twenty-four hours after conversion (fig 1C) there was a decided shift in the axis toward normal.  $S_1$  and  $R_{aVR}$  do not exceed 0.04 sec and  $S_5$  and  $S_6$  are less than 0.04 sec.

## CONCLUSION

Although no conclusions can be drawn from a single case it is hoped that the addition of this case to the few previously reported will eventually aid in the full evaluation of this relatively new therapeutic agent.





# Surgical Considerations in Sudden Cardiac Arrest

Charles K. Holloway Jr. *Lieutenant Commander MC U S N (1)*

**S**UDDEN cardiac arrest may develop in a heart that is relatively normal, especially during surgical procedures. Almost every institution that has a large surgical service is likely to experience one or more such cases each year. It is desirable then, that the surgeon faced with the urgent and serious complication of cardiac arrest have in mind a definite plan for providing the most effective therapeutic measure possible. Three cases of sudden cardiac arrest have occurred at this hospital between September 1949 and May 1950. Consideration of these cases has stimulated us to formulate a coordinated plan for the treatment of possible future accidents.

## CASE REPORTS

**Case 1** — A 30-year-old man, presenting a deep progressive obstructive jaundice was prepared for an exploratory laparotomy on 27 September 1949. Cholelithiasis or carcinoma of the head of the pancreas was the preoperative diagnosis. He received 0.2 gram of pentobarbital sodium 80 minutes before anesthesia and 16 mg. of morphine and 0.4 mg. of atropine sulfate 50 minutes before anesthesia was induced. A Levine tube was inserted into the stomach shortly before the operation. At 0870 spinal anesthesia using 7.5 mg. of tetracaine hydrochloride, 112 mg. of procaine hydrochloride and 0.5 mg. of epinephrine hydrochloride was induced. Fifty milligrams of ephedrine sulfate were given subcutaneously at the same time. Anesthesia was elicited to the level of the fourth thoracic vertebra in about 10 minutes. Within 10 more minutes a right subcostal incision was made. At that time it was noted by the surgeon who called it to the attention of the anesthetist that there was no bleeding from the skin or subcutaneous tissue. No pulse respiration or blood pressure could be elicited. A diagnosis of cardiac arrest was made. An anterior chest incision was immediately made over the left sixth interspace. The fifth and sixth cartilages at the costochondral junctions were cut and manually retracted.

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(1) U. S. Naval Hospital, Oakland, Calif.

making an adequate and rapid approach to the heart. On exposure the heart was flaccid and dilated, and there was no motion. The heart was grasped between the thumb and forefingers and massaged about 100 times per minute for 3 minutes. During this time a peripheral blood pressure of 80/60 was maintained. Two cubic centimeters of 1 percent solution of procaine hydrochloride was introduced into the ventricular myocardium and 3 cc of a similar solution was introduced into the pericardial sac. Almost at once the heart began spontaneous rhythmic contractions of good strength.

Intermittent, artificial, positive-pressure oxygenation was maintained with an endotracheal tube which had been introduced when the chest was opened. This was continued for 1 hour after the detection of cardiac arrest. Two hundred cubic centimeters of 25 percent solution of serum albumin was administered intravenously during the resuscitation to help maintain the circulating fluid volume and to decrease cerebral and pulmonary edema. It was estimated that the patient sustained a relative or total anoxia of about 9 minutes. It was less than 12 minutes before the patient re-established spontaneous cardiac action. The chest and abdominal skin incisions were closed about 1 hour after the diagnosis of cardiac arrest. Good cardiac action was observed for 25 minutes before the chest incision was closed. Electrocardiographic tracings (lead 3 only), taken about 50 minutes after the diagnosis of cardiac arrest, revealed inverted T-wave and a slowed QRS complex with regular sinus rhythm. Subsequent tracing showed a persistent inverted or diphase T 3 with normal sinus rhythm. These findings were interpreted as insufficient evidence for significant myocardial damage. Within a few hours after his return to the ward the patient developed progressive decerebrate rigidity, coma and hyperpyrexia. He died about 40 hours after the cardiac arrest of cerebral damage and pulmonary edema.

A postmortem examination revealed (1) carcinoma of the head of the pancreas obstructing the common bile duct; (2) extensive cerebral edema and congestion with generalized neuronal degeneration in the basal ganglia and medulla; and (3) postsurgical hemorrhagic pericarditis.

*Comment.*—The early detection of cardiac arrest is essential if successful treatment is to be accomplished. In this case it is highly probable that the cardiac arrest took place some time before the incision was made because it was the surgeon and not the anesthetist who recognized the first signs of anoxia. Had a qualified anesthetist been at the head of the table the cardiac arrest might have been discovered several valuable minutes earlier. (2) Chapman (3) has suggested that in patients with deep jaundice the presence of biliary products in the myocardium may increase the irritability of the heart and thus tend to facilitate the occurrence of cardiac arrest. When the

(2) American College of Surgeons: *Manual of Hospital Standardization*, 1945, pp. 44-45.

(3) Chapman, H. J. Personal communication.

chest was opened it was noted that the heart was flaccid and still, which is characteristic of a vagal standstill. Here it might have been to advantage to have added epinephrine to the procaine solution that was introduced into the heart. This is a small point in this case because the heart began beating almost at once when massage was started but it might have been of great importance if the heart had been slow to respond. The most probable cause of the failure to save the patient was cerebral anoxia of too-long duration. Irreversible changes had taken place in the vital centers before the circulation could be re-established. Delay in diagnosis and delay in opening the left chest and massaging the heart both contributed to the failure.

**Case 2.**—A 50-year old man with a large mass in the right side of the abdomen, recent progressive jaundice and intestinal obstruction was prepared for an exploratory laparotomy on 9 December 1949. He was given 0.2 gram of pentobarbital sodium 1 hour before anesthesia and 16 mg. of morphine sulfate and 0.5 mg. of atropine sulfate subcutaneously 30 minutes before anesthesia was induced. At 1000 he was given a spinal anesthesia of 150 mg. of procaine hydrochloride, 10 mg. of tetracaine hydrochloride and 0.26 mg. of epinephrine hydrochloride. At 1010 anesthesia was recorded to the level of the seventh thoracic vertebra. The blood pressure was 110/60 and the pulse 118 at the time. At 1020 before an incision could be made the anesthetist at the head of the operating table noted the absence of respirations, pulse and blood pressure. A diagnosis of cardiac arrest was made. An endotracheal tube was inserted and intermittent artificial positive pressure oxygenation was begun. Within 3 minutes 0.2 mg. of epinephrine hydrochloride was introduced into the cardiac chamber through the chest wall and the cardiac musculature was stimulated with a needle. There was no change in the patient's condition. By 1030 more than 10 minutes after the diagnosis of cardiac arrest had been made the left side of the chest was opened and manual cardiac massage at a rate of 100 strokes per minute was begun. Ten cubic centimeters of a 1 percent solution of procaine hydrochloride were injected into the pericardial sac, and 3 cc. were injected into the myocardium. Weak, twitching motions of the myocardium were noted during the first 10 minutes after the chest was opened. Cardiac massage was continued for 50 minutes without any sign of recovery and the patient was pronounced dead at this time.

Necropsy revealed carcinoma of the head and body of the pancreas with metastases to the abdominal viscera. No examination of the brain was made.

**Comment.**—Early and accurate diagnosis of cardiac arrest was made by the anesthetist who also inserted an endotracheal tube and began intermittent, artificial oxygenation well in time for successful resuscitation. The surgical team failed completely to carry out in any reasonable time the only procedure that could have promised a chance for

the patient thoracotomy and cardiac massage. Needling the heart through the chest while the precious seconds ticked away was a useless procedure without justification. Irreversible damage to the central nervous system had doubtless taken place by the time thoracotomy and cardiac massage were finally done more than 10 minutes after the diagnosis of cardiac arrest. Delay in cardiac massage through the left chest obliterated any possibility of resuscitation in this case.

*Case 3.*—A 17-year-old boy with a diagnosis of acute appendicitis, was prepared for an emergency appendectomy on the evening of 5 April 1950. He was given 0.1 gram of pentobarbital sodium orally and 16 mg. of morphine sulfate and 0.4 mg. of atropine sulfate, hypodermically 45 minutes before the operation. At 2115 spinal anesthesia was induced using 7.5 mg. of tetracaine hydrochloride, 112 mg. of procaine hydrochloride, and 0.5 mg. of epinephrine hydrochloride. At 2130 a right Rocky-Davis incision was made and a recently perforated appendix was found. The base of the appendix was ligated and the mesoappendix was clamped within 30 minutes after the anesthesia was given. At this point the patient was heard to give a low moan, and the entire operating team noted that he had become pulseless and cyanotic. No blood pressure reading could be elicited. The drapes were immediately thrown back and an anterior chest incision made in the left third interspace. The heart was found to be perfectly still. Manual massage was begun and within 10 seconds the heart began feeble contractions which rapidly became forceful. Positive pressure oxygenation at 12 mm. of mercury was begun before the chest was opened but the patient recovered normal respiratory movements before an intratracheal tube could be inserted. The blood pressure was recorded as 100/50 five minutes after the arrest, and as 140/70 by the time the chest was closed about 30 minutes later. One gram of procaine hydrochloride in 5 percent dextrose solution in distilled water was given intravenously as the chest was being opened. The pulse when the patient left the operating room at 2300 was 100 per minute and of good volume and force. The respirations were normal, and the diaphragmatic excursions were equal.

Two and one-half hours after he returned to his ward, the blood pressure was 128/78, the pulse was 124, and the respirations 24. The patient had reacted from the anesthesia by this time and seemed mentally clear. He was given 500 cc. of whole blood at this time. An electrocardiograph tracing taken 20 hours after the arrest, revealed an inverted T-wave in lead CF-4 which was interpreted to be of minimal significance. A tracing taken on the third postoperative day revealed the same findings as the previous one. The patient remained clear mentally from the time he reacted from the anesthesia. He had amnesia only for the interval that he was unconscious. He developed an infection complicating his abdominal wound. This cleared satisfactorily and he was discharged from the hospital in good condition on the twenty-third postoperative day.

*Comment.*—An alert surgical team acted with dispatch at the first signs of cardiac arrest in this case. The heart was massaged before irreversible central nervous system damage could take place. Resuscitation was successful, and the patient made a complete recovery because the surgical team and the anesthetist carried out a planned co-ordinated procedure swiftly and effectively.

## DISCUSSION

*Incidence.*—A review of recent literature reveals that little work has been done on a statistical evaluation of the incidence of sudden cardiac arrest. Hamilton Bailey (4) in 1941 found only 50 cases reported since 1902. Ruzicka and Nicholson (5) reported 9 cases in a 5-year survey at the Lahey Clinic. Because many cases probably go undiagnosed or misdiagnosed the incidence of sudden cardiac arrest may be higher than is indicated by statistics.

*Diagnosis.*—Early accurate recognition of this condition followed promptly by adequate therapeutic measures may be life-saving (6). The anesthetist, at the head of the operating table is the logical person to detect the first signs of cardiac arrest. It is imperative that a qualified anesthetist be present for all local, spinal, and intravenous anesthetics (2). Cardiac arrest may be recognized by (1) sudden imperceptible pulse (2) labored respirations which soon stop (3) sudden cyanosis followed by a mottled diffuse ashen-gray color (4) inaudible heart sounds (5) widely dilated pupils (6) imperceptible blood pressure and (7) the absence of bleeding or pulsations at the operative site. Where possible a direct writing electrocardiographic tracing would be of great value in determining the exact nature of the arrest.

The causes of sudden cardiac arrest are as follows:

1. Ventricular fibrillation is the commonest cause. Such as arrhythmia is thought to be most frequently encountered during the stages of light anesthesia either in the first 30 minutes or during the recovery when the myocardium is most irritable (7). The ventricles pass into a state of incoordinate ineffective aimless twitchings. Ventricular fibrillation is caused by any influence that contributes sufficiently to the hyperirritability of the myocardium (8), such as (a) the epinephrine which may be released during the excitement period of anesthesia

(4) Bailey H.: Cardiac massage for impending death under anesthesia. *Brit. Med. J.* 2: 84-85 July 19 1941.

(5) Ruzicka, E. R., and Nicholson, M. J.: Cardiac arrest under anesthesia. *J. A. M. A.* 135: 622-628, Nov. 8, 1947.

(6) Touroff, A. S. W., and Adelman, M. H.: Resuscitation after 40 minutes in cardiac arrest. *J. A. M. A.* 139: 844-847 Mar. 26, 1949.

(7) Lempson, R. S.; Schaffer, W. C.; and Lisciola, J. R.: Acute circulatory arrest from cardiac fibrillation for 27 minutes, with complete recovery. *J. A. M. A.* 137: 1575-1578, Aug. 28, 1948.

(8) Best, C. H., and Taylor, N. B.: *Physiological Basis of Medical Practice*, 5th edition. The William & Wilkins Co. Baltimore, Md., 1950. pp. 238-239.

(9) (b) the parenteral administration of epinephrine and related amines in conjunction with cyclopropane, chloroform or ethyl chloride; (c) thyrotoxicosis with cardiac changes; (d) severe relative anoxia such as may be seen with certain types of anesthesia; (8) (e) electric shock, such as electrocution, lightning and certain small currents; (8); (f) trauma to the heart and chest wall particularly associated with thoracic operations when a satisfactory depth of anesthesia has not been attained; (8) (g) ventricular paroxysmal tachycardia in which fibrillation may be a terminal event; (8) and (h) toxic doses of digitalis or quinidine; (8).

2. Reflex stimulation. A strong vagal reflex can depress all pace-making stimulation and cause complete arrest of the heart. There are many such situations in which spontaneous recovery occurs, but reflex standstill with the patient on the operating table may be a more serious complication. Vagal standstill may be caused by: (a) stimulation of the vagus at the hilus of the lungs along the esophagus, or trachea and in the bronchi, which may complicate operations and endoscopy (6, 10, 11); (b) stimulation of hyperactive carotid sinus; (10) (c) pulmonary embolus of fat or air; (d) increased vagal excitability from premedication, anesthesia or relative anoxia; (7); (e) traction on the mesentery during an abdominal operation; (8) and (f) anoxia; (8).

3. Acute fulminating failure of the myocardium caused by myocardial ischemia as a result of sudden massive occlusion of a coronary vessel or sudden myocardial depression from toxic drugs or drug idiosyncrasy; (10).

*Prophylaxis*—Cutler and Zollinger (12) have properly described the ideal circumstance for satisfactory surgical risk as those that permit the patient to come to operation with his tissues properly hydrated, the food to serve in their normal status, the metabolism adjusted as perfectly as it may be, the intestines working normally, the circulation at its optimum efficiency and the nervous system undisturbed and peaceful as in daily life. Certainly the good surgical risk, evaluated by the standards, will incur minimal danger from the possibility of cardiac arrest to operation. Moreover the incidence of cardiac arrest might be reduced still further if the surgeon with the prevention of cardiac arrest in mind: (1) has a cardiologist evaluate the patient's cardiac arrhythmias and correct them if possible; (2) avoids giving toxic doses of digitalis, quinidine and other drugs that increase myocardial irritability; (3) avoids giving combination of drugs that act together to increase the tendency toward the development of cardiac arrest; (4) and

(9) The irritability thus produced prevails particularly when the myocardium has already been irritated by cyclopropane, chloroform, or ethyl chloride.

(10) Adams, J.: Techniques and Procedures of Anesthesia. Charles C Thomas Publisher, St. Louis, Mo., 1947, pp. 141-153, 358.

(11) Mott, F. R.: Removal of heart from muscular fibrillation with drugs compared with venous shock. Proc. Soc. Exper. Biol. & Med. 56: 634-636, Jan. 1953.

(12) Cutler, E. C., and Zollinger, R.: Atlas of Surgical Operations. The Macmillan Co., New York, N. Y. 1959, p. 13.

sure himself that the induction of and recovery from anesthesia takes place under as near ideal conditions as possible avoiding disturbing noises moving jolting and manipulation through the use of special induction and recovery rooms and (5) avoids intubations under light anesthesia

At the operating table it is our practice to put 1 gram of procaine hydrochloride in the bottle of intravenous fluids that is in use for patients undergoing major operations. This procedure may offer some protection against the development of cardiac arrhythmias during the operation. During chest operations it is desirable to infiltrate well the hilus of the lung with a 1 percent solution of procaine hydrochloride without epinephrine to further protect the vagi from disturbing external stimuli during the manipulations at that point.

*Treatment.*—The primary objective of treatment is the re-establishment of general circulation with resumption of oxygen exchange (7). The urgency of this measure is obvious when the operator keeps in mind that the experimental deadline for complete recovery of the central nervous system after failure of its circulation is 3 minutes and 10 seconds. After 8 minutes of circulatory failure and anoxia there is almost 100 percent mortality. Patients who recover after 3 minutes and 10 seconds of total cerebral anoxia are likely to show gross personality and central nervous system defects (13). Relative anoxia may allow a longer period before irreversible changes take place but if the patient is in poor physical condition the tolerance of the central nervous system may be diminished and allow irreversible changes much sooner. At operation it is not possible to estimate accurately either the patient's tolerance to the duration of or the degree of relative anoxia. When the diagnosis of cardiac arrest is made the following therapeutic measures should be initiated without delay

- 1 The anesthesia is discontinued and an endotracheal tube is inserted if one is not already in use. Oxygen is administered at a positive pressure of not more than 12 mm. hg. at a rate of from 20 to 24 cycles per minute. This is continued until the patient again breathes spontaneously (6, 14). Beck and Rand (15) suggested the use of a mechanical breathing machine as an important aid in effecting successful artificial respiration over a long period of time and recommended that every operating room have such a machine. The Bennet breathing machine is available in our operating room for respiratory emergencies.

- 2 The patient is placed in the Trendelenberg position.

(13) Ves Berger, L. M.; Gibbon, M. H.; and Gibbon, J. H. Jr.: Temporary arrest of circulation to the central nervous system; physiological effects. *Arch. Neurol. & Psychiat.* 43: 615-634, Apr. 1940.

(14) Stage, J. T.: Cardiac arrest under anesthesia. *South. M. J.* 42: 597-603, July 1949.

(15) Beck, C. S., and Rand, H. J., III. Cardiac arrest during anesthetic and surgery. *J. A.M.A.* 141: 1230-1233, Dec. 24, 1949.





# A Sectional Leg Splint

Burdick G. Clarke *Lieutenant Commander A. C. U. S. N. R. (1)*

THE high frequency of extensive soft tissue wounds and of compound fractures of the legs is well recognized in modern warfare. To minimize shock and soft tissue damage it is necessary to splint these limbs early. The hinged, half-ring leg splint known variously as the Keller-Blake splint or the half-ring Thomas leg splint, is a standard appliance for this purpose in the Armed Forces. Because



Figure 1. Folding sectional half-ring leg splint compared with a standard Thomas splint.

this indispensable item is 4 feet long it is difficult to transport in ground warfare and too large for convenient stowage aboard ships or aircraft. To overcome these disadvantages, a folding sectional modification of the standard splint (fig. 1) has been designed. It is proposed that this item be listed as expendable to be discarded when the pa-

(1) With the 1st Evacuation Hospital Fleet Marine Force at time of writing this article now at New Haven Hospital, New Haven, Conn.

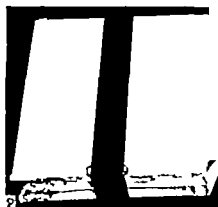


Figure 2. Container. Figure 3. Traction strap. Large-sized battle dressings, 2 medium-sized battle dressings, triangular bandage, tourniquet, 4 muslin bandages, safety pins, and morphine syrette.

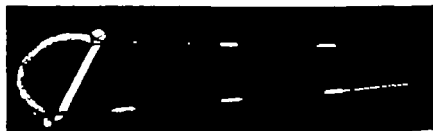


Figure 4. An embled sectional leg splint.



Figure 5. Assembly of sectional leg splint.

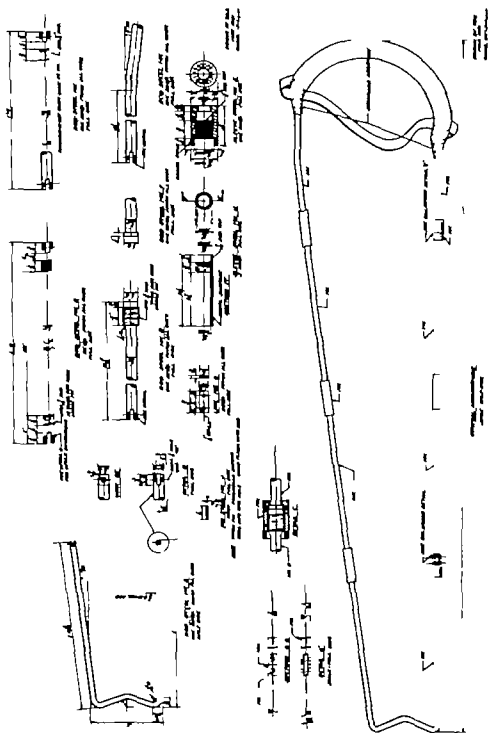


Figure 6

patient's movement to the rear permits definitive treatment. It may be packed in a small waterproof camouflaged, disposable container (fig. 2) holding in addition to the splint, enough camouflaged dressings, traction straps bandages, and morphine (fig. 3) for complete emergency management of a compound fracture of the leg. This kit, weighing 7 pounds complete is fitted with wire hooks for attachment to belt or pack and may be brought forward to dressing stations in land or amphibious combat while the carrier's hands are free to use litters or to aid in self-protection. The container is readily stowed, individually or in numbers aboard vessels, small boats, landing craft, helicopters, or airplanes. It is adapted for such specialized operations as air-sea rescue and medical resupply by airdrop.

The sectional splint alone weighs  $4\frac{1}{2}$  pounds 8 ounces more than the standard splint. The complete kit measures  $2\frac{3}{4}$  by  $12\frac{1}{4}$  by 13 inches (0.25 cu. ft.); the standard model without packaging requires 0.45 cu. ft. of storage space. The parts are manufactured with coarse threads and sufficient tolerances to permit assembly in less than 1 minute even when soiled with sand or dirt. The assembled piece (fig. 4) identical in size with the standard splint and is made ready for use by extending the hinged sections and locking them by screwing threaded sleeves in place over the joints (fig. 5). (EDITOR'S NOTE. Enlarged diagrams of the exact specification (fig. 6) for guidance in the construction of the splint may be obtained from the Armed Forces Medical Journal Bureau of Medicine and Surgery Department of the Navy Washington 25, D. C.).

**ACKNOWLEDGEMENT** The model were produced in the shop of the 7th Engineer Battalion, Fleet Marine Force. Development of design was made possible by the assistance of Lieutenant G. D. Schryver, USMC, and of Mr. William R. Ahrendt. Drawing were prepared by Technical Sergeant T. D. Scott, USMC.

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be tested very rapidly this method of examination depends on the experience of the examiner for its accuracy. The functional method is simple and can be used by anyone with ease, rapidly and accurately.

#### *Upper extremity*

Radial nerve injury causes wrist drop manifested by inability to extend (1) the wrist, (2) the fingers at the metacarpophalangeal joints with the interphalangeal joints flexed and (3) the thumb.

Median nerve injury causes ape hand manifested by inability to (1) make a five-finger cone, (2) rotate the thumb over the palm, (3) abduct the thumb at a right angle to the palm and (4) flex the index finger when the others are extended.

Ulnar nerve injury causes claw hand manifested by inability to make a four-finger cone and to abduct and adduct the fingers.

#### *Lower extremity*

Femoral nerve injury causes inability to extend the knee. Sciatic nerve injury causes flail ankle manifested by inability to extend or flex the ankle. Common peroneal nerve injury causes foot drop manifested by inability to dorsiflex the ankle and to extend the toes. Posterior tibial nerve injury causes inability to plantar flex the foot, and to flex the toes.

Table 1 gives a more detailed outline of the sensory and motor function of selected peripheral nerves most commonly injured in war wounds.

No attempt has been made to discuss the various diagnostic and prognostic aids which are available at nerve centers. Electrical examination of muscles including electromyography is of great importance not only in establishing the more exact localization and the type of peripheral nerve injury but also as a prognostic guide.

### TREATMENT

The prompt recognition of incidental nerve lesions is essential to total recovery and their presence should be recorded when recognized. The absence of nerve lesions at the point of injury is equally important and should likewise be noted. Early treatment of peripheral nerve lesions should not be allowed to interfere with saving life or limb but is required to prevent serious sequelae often irreversible such as contractures, stiffness and fibrosis of joints and muscles. Until such time as the patient arrives at a point in the chain of evacuation where definitive treatment can be administered, it is important to support the involved part. For the upper extremity a simple sling may give sufficient support to prevent stretching of the paralyzed parts. A simple foot-drop splint may be all that is necessary in the lower extremity to preserve functional position. Contractures of muscle and tendons and stiffness of joints may be prevented by frequent passive movement of the involved parts through a full range of motion. If possible the patient should be instructed to do this for himself.

TABLE 1 *Objective findings in peripheral nerve injuries*

Lesion	Nerve	Muscle	Motor system	Function involved	Sensory system	
					Sensory involvement	
Axillary		Deltoid		Abduction of arm to horizontal plane	Over deltoid muscle	
Massiculocutaneous		Biceps brachii		Flexion and supination of forearm	Anterolateral surface of forearm	
Radial		Triceps Extensor carpi radialis longus and brevis Extensor digitorum communis Extensor pollicis longus and brevis		Extension of elbow Extensor of wrist proximal angle and thumb (Wrist and finger drop)	Web between 1st and 2nd metacarpal on dorsum of hand or no sensory loss	
Ulnar		Flexor digitorum profundus IV and V Flexor carpi ulnaris Flexor pollicis brevis (1/2) Abductor digiti quinti Opponens digiti quinti Lumbricales III and IV Interossei Adductor pollicis		Flexion of distal interphalangeal joint of ring and little fingers Flexion of wrist with ulnar deviation Flexion of metacarpal joint of thumb Abduction of little finger Opposition of little finger Flexion of metacarpal joint of ring and little fingers Abduction and adduction of fingers Adduction of thumb	One-half of ring and all of little fingers and hypothenar eminence and corresponding area of dorsum on hand	



TABLE 1. Only the findings in peripheral nerves in the Coiled

Lesion	Nerve	Muscle	Motor system	Function involved	Sensory involvement	Sensory system
Median		Extensor digitorum profundus I and II		Flexion of distal metacarpal angular joint of index and middle fingers		
		Proneator or Flexor carpi radialis II		Pronation of forearm		
		Flexor digitorum sublimis		Flexion of wrist radial deviation		
		Flexor digitorum profundus I		Flexion of proximal interphalangeal joint		
		Flexor pollicis longus		Flexion of thumb		
		Flexor pollicis brevis (A)		Flexion of metacarpal angular joint of thumb		
		Abductor pollicis brevis		Abduction of thumb in plane critical to palm flexion		
Femoral		Opponens pollicis		Opposition of thumb to other fingers		
		Lumbrical I and II		Flexion of metacarpal angular joint of index and middle fingers		
		Ilia		Flexion of thigh at hip joint		
		Pectineus		Flexion of thigh on pelvis		
		Sartorius		Flexion of thigh on pelvis		
		Quadriceps		Extension of knee		
				Anteromedial aspect of thigh		Anteromedial aspect of thigh

TABLE 1 *Objections found as in peripheral nerve disease*—Continued

Lesion	Motor system	Sensory system
Nerve	Muscle	Function involved
Obruator	Obturator externus abdominal Gracilis Adductor longus Adductor magnus Adductor brevis	Outward rotation of thigh Flexes and medially rotate leg; adducts thigh Adduction of thigh Adduction of thigh
Sciatic	Hamstrings Biceps femoris Semitendinosus Semitrambranosus	Flexion of knee
B. Common peroneal Superficial peroneal	Peroneus longus Peroneus brevis Tibialis anterior Extensor digitorum longus	Everson of foot Dorsiflexion of foot and toes
Deep peroneal	Extensor hallucis longus Peroneus tertius Extensor digitorum brevis Gastrocnemius Soleus Tibialis posterior	Dorsum of foot and lateral aspect of leg Web between great and 2d toes on dorsum of foot
C. Tibial	Flexor digitorum longus pedis Flexor hallucis longus	Sole of foot { Plantar flexion of ankle Inversion with plantar flexion of foot Flexion of toes Flexion of great toe

## SUMMARY

Early recognition of peripheral nerve injuries and early support of the paralyzed parts and the prevention of joint stiffness and muscle and tendon contractures are important.

# Metallic Foreign Body in the Appendix

## A Case Report

James F. Dougherty *Lieutenant junior grade MC, U. S. N. R.*

Samuel L. Cohen, *Captain, MC, A. U. S.*

Peter Zanca, *Colonel, MC, U. S. A. (1)*

A SOLDIER, 22 years-old reported to the hospital on 16 January 1951. On the preceding day he first noticed generalized abdominal pain and nausea. There was no vomiting, constipation, or diarrhea. The pain became acute and localized in the right lower abdominal quadrant. A careful history revealed that the patient had eaten a squirrel killed with buckshot 2 or 3 years earlier.



Figure 1 Barium enema examination showing a radiopaque foreign body in the appendix.

On physical examination the abdomen was soft. There was moderate tenderness over McBurney's point. There was no rigidity or rebound tenderness. Rectal examination was negative. The leukocyte count

(1) U. S. Army Hospital, Camp Cooke, Calif.

wa 11,000 with 61 percent neutrophils, 33 percent lymphocytes, and 1 percent monocytes. Although history and physical examination suggested that the patient was suffering from an acute appendicitis, however, the findings were not conclusive and a conservative plan of therapy was indicated. A plain film of the abdomen was taken which revealed a metallic foreign body about 3 mm. in diameter in the right lower abdominal region. Barium enema examination showed this foreign body in the lumen of the middle third of the appendix (fig. 1). The abdominal symptoms persisted so on 5 February an appendectomy was performed. A lead buckshot (fig. 2) was recovered. There was moderate localized mucosal injection about the foreign body and microscopic examination of the appendix revealed a lymphoid hyperplasia.



*Figure 2. Pathologic specimen showing buckshot in lower appendix.*

### CONCLUSIONS

Foreign bodies in the appendix may cause symptoms simulating either chronic recurrent appendicitis. This condition should be considered in the differential diagnosis of pain in the right lower abdominal quadrant.

# Dental Responsibility in Oral Cancer

Eugene J. Murphy *Lieutenant Command* D.C. U. S. N. R. (1)

THE important position held by the dentist with regard to the early detection of oral cancer has been recognized by the dental and medical professions for only a short time. Because the dentist is a specialist in treating the mouth it is imperative that he accept this responsibility. In the past dentistry has received very little encouragement in this field. It is only recently that a cancer institute has made teaching grants to dental schools.

The early symptoms of oral cancer are rarely painful or alarming to the victims. Martin (2) pointed out that these persons frequently enjoy excellent health. The common practice of having a dental checkup twice a year enables the family dentist to examine the mouth under almost ideal conditions. Failure to notice and recognize oral cancer symptoms through carelessness on the part of the dentist has cost many lives. It is the dentist's duty to examine the entire oral cavity, not just the teeth and gums. Any deviation from normal oral anatomy must be thoroughly investigated and a definite diagnosis established as soon as possible. Procrastination on the part of the dentist or physician may often prove fatal. Robinson (3) emphasized the fact that the man who first detects a lesion or growth should complete the diagnosis and if a biopsy is indicated, it should be made by him and reported by a qualified oral pathologist.

Blair et al. (4) believed that with the possible exception of involvement of the paranasal sinuses, oral cancer should be readily detected by the careful observer. They maintained that the clinical appearance and findings on palpation of these early growths are usually

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(1) Veterans Administration Hospital, Louisville, Ky.

(2) Martin, H.: Mouth Cancer and the Dentist. Monograph, Apr. 1949.

(3) Robinson, H. B. G.: Looking Gift Horses in the Mouth. J. Michigan State Dent. Soc. 32: 116, June 1950.

(4) Blair, V. P., Moor, S. J. and Byars, L. T.: Cancer of the Face and Mouth. C. V. Mosby Co., St. Louis, Mo., 1911.

so characteristic that their nature and relative virulence can be gaged with accuracy. Most practicing dentists and physicians, however, do not possess this ability. In every case it is wise to base a diagnosis on a biopsy report. In 21 years of both general and specialized practice I have seen many oral neoplasms but have never completed a diagnosis without a report from the pathologist.

The use of intraoral roentgenograms often helps to differentiate between salivary duct or gland obstructions and cervical lymph node involvement. This is particularly true when there is a lump or so called "knot" in the neck. Nathanson (5) noted that frequently the first symptom of a highly malignant cancer of the tonsil which is noticed by the victim is a lump in the neck. Ackerman and del Regato (6) classified oral cancers as follows: (1) carcinoma of the lower lip; (2) carcinoma of the upper lip; (3) carcinoma of the mobile portion of the tongue (anterior two-thirds); (4) carcinoma of the floor of the mouth; (5) carcinoma of the buccal mucosa; (6) carcinoma of the upper gingiva; (7) carcinoma of the lower gingiva; and (8) tumor of the lower jaw. To this we would add tumors of the hard and soft palate, tonsil, and oral pharynx.

The following cases were encountered in this hospital and were selected from many cases seen over a 4-year period. The dental examiner in a large general hospital sees a greater number of patients than the average dentist, but detection of mouth cancer depends on how well the examination is done and/or on the number of patients seen.

### CASE REPORTS

**Case 1.** A 54-year-old man reported to the dental clinic for routine dental roentgenograms and examination. He was wearing full upper and lower acrylic denture which had been made about 8 months earlier. Examination disclosed a red ulceration about the size and shape of the little fingernail just posterior to the junction of the hard and soft palate and slightly to the right of the median line. The post dam area of the upper denture did not extend to within 6 to 8 mm of the lesion and clearly was not a constant source of irritation. The patient was not aware of any particular soreness but stated that he had recently noticed a slight difficulty when swallowing. He recalled that at the time the denture were made the dentist mentioned that he had a spot in the palate which was probably caused from overextension of the old vulcanite denture he had worn for about 16 years. A biopsy specimen was submitted to the pathologist who reported squamous cell carcinoma. The cancer had infiltrated into the tonsil and pillar making the prognosis extremely bad. This is an example of dentist ignoring a lesion on the assumption that it was merely caused by a denture irritation.

(5) Nathanson, L. T. Medical progress; Cancer of the mouth. *New England J. Med.* 274: 468-490, Sept. 1943.

(6) Ackerman, L. V. and del Regato, J. A. *Cancer Diagnosis, Treatment, and Prognosis*. C. V. Mosby Co., St. Louis, Mo., 1947.



Figure 1 (case 2). Carcinomatous invasion of the mandible. (A) Lateral view. (B) Anteroposterior view.



**Case 2.** A 52-year-old man was seen in the dental clinic after full-mouth roentgenograms had been routinely taken the day before. He remarked that he hoped there were no teeth to be extracted as he suffered from diabetes and always had pain and swelling after his teeth were removed. On examination an irregularly-shaped ulcer was seen arising from a partially healed lower molar socket on the left. According to the patient the tooth had been extracted about 5 or 6 months before with the usual postoperative pain and swelling. He returned to the dentist several times over a period of from 5 to 6 weeks for treatment and assumed that everything was all right because the pain and swelling had subsided. A diagnosis of squamous cell carcinoma was made from our biopsy specimen.

Roentgenograms (Fig. 1) showed extensive involvement of the mandible. The cervical lymph nodes were not enlarged. The ulcer was small and did not appear to have reached the floor of the mouth. A radical neck dissection and removal of the left portion of the mandible beyond the symphysis was necessary. This case demonstrates that slowly healing sockets or wounds of the mouth must be viewed with suspicion and not ascribed to an infection or systemic disease.

**Case 3.** A 49-year-old man was referred to me by a country practitioner because of dull, nagging aches in all the upper teeth on the left side which had persisted for almost a year and was getting more severe every day. In the service and in civilian life he had been treated for sinusitis several times. The physician had referred him to a dentist who he complained that his teeth bothered him. The dentist took full-mouth roentgenogram but failed to find any focus or infection or even carious lesion and he bluntly suggested that the patient should seek psychiatric treatment. Examination in this hospital disclosed a almost complete complement of teeth with only the upper third molars missing. They had been extracted many years earlier. There was moderate abrasion caused by excessive tobacco chewing but no signs of infection or caries. The tissues were normal and healthy in appearance. Because we were satisfied that the pain was not of dental origin and the roentgenograms showed a cloudiness of the antrum, the patient was referred immediately to the ear, nose and throat service where after interpretations of the roentgenograms by the radiologist carcinoma of the antrum was suspected. This was confirmed by biopsy. This type of hidden neoplasm is not a true local cancer unless it invades into the palate. This case demonstrates indirect cancer detection through the proper cooperation and consultation with other services in the hospital. When we can find no cause for a patient's complaint we must never assume that we are infallible and that the patient is hypochondriac or a neurotic.

**Case 4.** A 62-year-old man visited the clinic shortly after being hospitalized because he was having trouble with a sore on the inside

posterior teeth were set out too far and this caused him to bite his cheek. Because this had bothered him for at least a year he had visited 4 or 5 dentists for adjustment. The last visit had taken place 3 months before his admission to the hospital. Examination showed a granular wartlike growth about the size of a copper coin in the center of the buccal pad. The patient was obese and any swelling present was not discernable. There were small scattered leukoplakial patches on the mucosa surrounding the growth but they did not extend downward into the lower ridge or the velum. None of the dentists consulted previously had mentioned an abnormal condition in his mouth or did more than trim the dentures. The biopsy specimen was diagnosed carcinoma. It was a slow growing lesion. This type of malignancy while not deep-seated often invades the body of the maxilla with fatal consequences.

*Case 5.* A 53-year-old man was examined physically and roentgenographically in the dental clinic for a possible focus of infection. He was wearing upper and lower partial dentures of cast gold which were well designed and beautifully finished and the entire mouth gave evidence of exceptional care on the part of both the patient and his dentist. During the examination when the patient was requested to raise the tongue to its fullest extent, a lesion was seen on the ventral surface. It extended from between the lingual vein and the plica fimbriata to the border but was not visible on the dorsum of the tongue. It measured about 7 by 3.5 mm and had a smooth, glossy, lumpy appearance. Although the patient had noticed a little "bump" under the tongue for several months he thought the lower denture was causing the trouble. He had visited his dentist who checked the partial denture, examined the area of irritation and advised him to leave the denture out as much as possible until the trouble disappeared. Because no particular discomfort or pain was present the patient assumed it was just another "canker sore." The biopsy report was squamous cell carcinoma of the tongue. This is an illustration of cancer appearing in a well cared for mouth. It is also an example of a dentist's failure to recognize a cancerous lesion.

*Case 6.* A 42-year old man was referred to me by a physician who reported that the patient had a cellulitis of the floor of the mouth. The man was acutely ill and complained of pain in the left mandible. One week prior to admission he noticed some difficulty in swallowing. There was a marked and generalized swelling of the lymph nodes on the left side. The swelling was nontender, firm and nonfluctuant. The skin was glistening and taut. There was no difficulty in opening the mouth. Examination showed a lesion extending from the left retromolar area around the mandible and base of the tongue into the right premolar region. The teeth in the entire left portion of the mandible and the anterior teeth were loose and carious. The tongue was swollen and indented from pressure against the lower teeth (fig. 2A). There was no



Figure 3 (case 6). Oulomycelitis and cancer of the mandible. (A) Cancer of the gum, tongue, and floor of the mouth. (B) Anteroposterior roentgenogram. (C) Lateral oblique roentgenogram.

feeling in the lip on the entire left side and there was some numbness on the right. The roentgenographic findings were those of a fairly extensive osteomyelitis of the mandible accompanied by a malignant invasion, (fig 2 B and C). The patient insisted that the pain and swelling began almost overnight. A physician had advised him to have his teeth extracted. He then consulted a dentist who refused to extract any teeth until the swelling subsided. As the swelling persisted and swallowing became difficult the patient went to the physician who referred him to this hospital. The biopsy specimen was interpreted by the pathologist as a grade 3 epidermoid carcinoma. It was believed that the patient was beyond cure. The pain was controlled with narcotics and the patient survived for almost 5 months.

*Case 7* A 56-year-old man was admitted to this hospital complaining of pain in his abdomen and legs. He asserted that he had never had a serious illness and had felt well until about 10 weeks earlier. He was seen in the dental clinic 3 days after being admitted. The ward physician reported that there were several hard movable nontender masses below the umbilicus and in the left groin and a malignancy was suspected. Examination of the mouth revealed a small ulcer in the upper right molar area. A biopsy specimen was taken and was reported as adenocarcinoma of the gum. Shortly after this report a definite diagnosis of cancer of the gastrointestinal tract was made. The chief interest in this case was the determination of the primary site. Oral cancers metastasize into the lymph nodes and infiltrate into the viscera but with the exception of cancer of the larynx the reverse is rare. In this case the small size of the oral ulcer and lack of cervical lymph node involvement would seem to eliminate it as a primary lesion. The gastrointestinal cancer was highly malignant and because of the extent of the metastases only palliative treatment was given. The patient died 6 weeks later with a diagnosis of metastatic adenocarcinoma, primary site undetermined.

### SUMMARY

The detection of oral cancer and precancerous lesions in the mouth is a definite responsibility of the dentist. A thorough examination together with a biopsy report is the surest method of establishing a diagnosis.



# Field Hospital Neuropsychiatric Service<sup>1</sup>

Harold Kolmaky *Captain MC, U.S.A.*

Richard K. Cole, *Captain, MC, U.S.A.*

**T**HIS report concerns the activities of the neuropsychiatric service of the 4th Field Hospital which served as the main psychiatric treatment center for United Nations Forces in Korea during the months of November and December 1950.

*Professional and other personnel assigned.* When first organized the service had one psychiatrist. It soon became apparent that one man could not handle the volume of work and an additional psychiatrist was assigned. Then as the service became the main psychiatric center in this theater another psychiatrist was added to the staff. It was found to be distinctly advantageous to have more than one psychiatrist not only to prevent too great a work load on any one man but also to make possible the discussion of unusual cases. In this way better care to this type of patient was afforded. The three medical officers had all been in psychiatric residency (civilian and Army) before being called or recalled to active duty in this theater. Each also had some experience with psychiatric cases at station hospitals in Japan before coming to Korea. In addition a nurse was assigned to the service during October and November but it was found to be an unnecessary luxury for the patients. Because the assignment of a nurse tended to play up the hospital atmosphere and increased the possibility of secondary gain from neurotic illness no nurse was assigned to the service in December. Four enlisted men with varying periods of training in neuropsychiatric work were assigned to the service. During the morning two medical technicians were on duty and during the later two periods of the day one medical technician was on duty. The medical technicians were responsible for the assignment of beds, insistence on shaving, showering and eating, administration of routine medications and observations on sleep, eating and behavior of patients. The chief psychiatric consultant for the Far East Command made several visits to the service during the period of

<sup>1</sup> Adapted from the Surgeon Circular Letter Far East Command, V L 6, N 3 1 Mar 1951 p 45-52.

operation and saw and discussed patients with psychiatrists. During these visits he also held consultations for the other services.

*Organization of wards.* The wards of the psychiatric service were separate from the medical and surgical wards. This was believed to be necessary because of the so-called infectiousness of some psychogenic symptoms. The psychiatrists had separate small offices in the same ward section. The patients slept on Army cots and usually made their own beds. Food was not served on the ward, all patients being encouraged to go to the mess hall for meals. The wards were located in permanent-type buildings and there was adequate heat. At no time were we limited in number of beds or in length of hospital stay. An attempt was made to segregate patients going to limited duty, full duty, and to J pan for evacuation. This, however, proved to be impractical because of the short period of hospitalization. In general, interviewing and treatment were carried on in the private offices. Patients sent for consultation from other services were seen on the psychiatric service unless they were confined to bed.

*Types of patient seen.* It soon became apparent that the type of patient seen when troops were engaged in active combat differed from that seen when there was a break in activity. During combat with the enemy there was an upswing in the number of moderate and severe anxiety reactions and in conversion reactions, but in the periods between combat more patients with other neurotic reactions, psychotic reactions, character disorders, and immaturity reactions were seen. The approximate distribution was 70 percent neurotic reactions, 10 percent psychotic reactions, 12 percent character disorders and immaturity reactions, 2.5 percent neurologic diseases, and 5.5 percent no disease found (including poorly motivated soldiers and normal combat reactions). The average number of daily admissions varied depending on the tactical situation, availability of transportation from the front, number of surgical casualties who had to be evacuated first, and availability of beds held for the division psychiatrists at clearing stations. In general there were from 10 to 30 admissions daily. During the latter part of November when Chinese forces began an all-out offensive, the number of admissions increased sharply. Usually there was a lag of from 2 to 5 days between the arrival of surgical and psychiatric casualties during active combat. Anxiety reactions were by far, the most frequent entities seen, with conversion reactions next in frequency.

It was soon learned that the symptomatology of the anxiety reactions was of little importance. It varied from patient to patient but almost universally the conflict was close to, if not at the level of consciousness. This conflict seemed always directly to involve the combat situations and the dangers to the soldier inherent to this situation. The therapist could quickly peel away the symptom layer and could discuss directly with the patient the conflict of which the patient was at least partly aware. In some perfectionistic compulsive patients defenses would quickly break down under the conditions of battle which

did not lend themselves to perfectionism and these persons would then develop a tremendous amount of anxiety. But in general the anxiety reaction was seen in those who were not of necessity compulsive and who had been exposed to a considerable amount of combat. The backgrounds and family life of these patients varied greatly.

The severe anxiety reaction was usually found in a patient who had considerable combat in this campaign (and sometimes in World War II as well). He would usually come in looking very tired with his face drawn and expressionless or full of terror. Tremulousness, vocal difficulty, dilated pupils, rapid pulse, profuse sweating, tremors, and sometimes lacrimation were seen. The subjective complaints usually included insomnia, anorexia, more than the usual weight loss, battle dreams (which seemed always to be attempts at mastery of a situation in which the patient believed he had failed). Usually there was an immediate precipitating factor such as the death of a friend, or the inability to remove one of the wounded of his platoon while under fire, which assumed great importance in such patients. Usually the neurotic symptoms did not appear until after the patient was removed from danger. This protective mechanism has also been noted in the other psychiatric syndromes. The symptoms of the less severe anxiety reactions were similar but milder and were frequently seen in soldiers who had gone into combat for the first time.

In the perfectionistic officer or soldier when the psychologic defenses break, depression often becomes part of the anxiety reaction. Typical of this type of reaction was a 25-year-old platoon leader who was admitted with marked apathy, anorexia, psychomotor retardation, and constipation. He said, "War is hateful, useless, terrible—I'd like to evacuate my whole platoon. Poor boys, I'm a misfit. I should have taken one of my wounded out, but I couldn't because of the shooting. He died. I'm no officer! This patient had straight A's in college, had been an excellent infantry lecturer, had been a pride to his outfit in the United States, and had done well on maneuvers. When he finally became a platoon leader after 3 months in Korea, the difficulties of combat broke his defenses down and his punishing superego took over with resultant severe anxiety symptoms and depression.

Conversion reactions as well as anxiety reactions almost always developed after the danger had passed. Many gross hysterical phenomena including total paralysis of both lower extremities, blindness, deafness, or amnesia were seen and all patients seemed to have a moderate to a great amount of indifference to their symptoms. These seemed to occur frequently in passive individuals after their first show of hostility. Typical of this was a 20-year-old soldier who came into the hospital after being treated for an upper respiratory infection for 1 month because of inability to talk above a whisper. He revealed under amytal that just prior to the development of aphonia he had killed some enemy soldiers (for the first time). This apparently disorganized his passive defenses.



allowing a conflict to break through with resultant aphonia. He was quite passive and said "I always walk away when I'm angry—that's best."

Surprisingly a large number of the psychotic reactions seen were in base troops or troops who had been in Korea but a short time. The symptoms were those of the usual psychotic reactions as seen elsewhere. Minimal stress in these patients either accentuated an already existing psychosis or tended to push the markedly regressed person into psychosis. A 26-year-old soldier who had been in Korea 2 weeks came into the hospital complaining "I have to go to the latrine often at night to urinate." It was found that this man had been responding to auditory hallucinations rather than urinary urgency. The voice was usually that of his grandmother long since dead. This patient had been raised by a domineering mother and a passive father who never allowed him to have dates or go out of town. He had been rejected by the draft boards in World War II on several occasions and had made fair adjustment in a box factory for several years. He had made a marginal adjustment during a year of active duty in the Army in the United States after which he was discharged. He was recalled in November 1950 from the enlisted reserve and hearing he was going to Korea he developed intense fear and "heard many strange voices on shipboard due to my seasickness." On admission the patient had flat affect, silly laughter, auditory hallucinations, irrelevancy, withdrawal from others on the ward, and his condition was diagnosed as a schizophrenic reaction.

Among the group labeled "No disease found" were several patients with the normal combat reaction. These showed minor sleep difficulties at the front, tremulousness, anorexia, apprehension, and other symptoms. When they were acquainted with the fact that most of their buddies had these symptoms they were relieved, and after a good night of sleep were quite willing to return to combat. Also in this group were patients with one or more subjective complaints and almost no anxiety. Typical of such persons was a 22-year-old oldman who complained of night blindness. When questioned, it was found that he could not see in the field on dark nights when flashlights were not allowed. Except for mild myopia his eyes were normal. He had lived in Boston most of his life and had no occasion to walk around without lights and was never particularly aware of the difference in ability to see at night without lights. He could see perfectly well in the field with flashlight or when the moon was full. He was introduced to these factors, and being a well-motivated soldier he soon went back to duty.

Being at an Army level, in addition to getting patients from division clearing stations which were the usual sources of patients, the service also received patients from base units. Many of these were character disorders and they were returned to their units for administrative handling rather than being allowed to clog medical channels.

*Type of interviews and treatment.* Each patient was seen on his first hospital day and each day of hospitalization by his own psychiatrist.

Usually only one psychiatrist saw the patient but sometimes he was seen by two. Usually during the initial interview which lasted from 15 to 30 minutes the psychiatrist would listen to the patient's history and after this was obtained, he would attempt to have the patient disclose the conflict quickly by questioning which was directed toward the minimizing of subjective complaints. Once the veneer of symptomatology was removed the patient's fear of combat, anger at a superior or feeling of inability to do a job for which he may not have been well suited were discussed with him. Great emphasis was placed in this form of brief directive psychotherapy on the current situation rather than on an often unreliable past history (which patients frequently exaggerated to make it appear that they had a lifelong neurosis). This type of therapy drawing forth the feelings of the patient in relation to current events was continued on the following day or two of hospitalization.

With this treatment, anxiety frequently lessened or disappeared as the patient began to understand what he was really concerned about. This therapy was effective at this level because rapid evacuation inhibited a complete establishment of the neurosis. The conversion reactions were treated by means of strong suggestion or abreaction usually under amylal narcoynthesis. Coramine in large doses was used to a great extent following amylal, in an attempt to have the patient wake rapidly following the abreaction. We were not overly impressed with the results following the use of coramine. Almost all conversion reactions became asymptomatic under this form of treatment and most patients could at least be returned to noncombat duty if not to combat duty. When the defense afforded by the conversion was removed almost all patients rather than becoming gratified at being able to walk or see would become hostile toward the therapist. This would usually pass off or decrease before the patient returned to duty.

Included in treatment was a routine insistence on cleaning up, shaving and eating within the first 6 to 12 hours. In psychotics and patients with severe anxiety reactions amylal sedation was used the first night starting with 0.4 gram and repeating if necessary to insure restful sleep. In general, sedation was used sparingly and was never routinely ordered. Frequently a patient with a moderate anxiety reaction looked much improved after he merely cleaned up and had a good night's sleep. Brief outpatient psychotherapy was attempted with several patients from base units. The emphasis in the interview and therapy was always on the current situation in combat and what was happening in the interpersonal relationship between patient and doctor. The patient was not allowed to use the cloak of symptoms without exploration of the conflict. We are much encouraged by our results using this form of psychotherapy.

*Advantage of being part of a field hospital.* Having a main treatment center operate as part of a field hospital in a combat theater was different from the usual practice in World War II in which independent psychiatric

treatment centers were set up. By so operating liaison with the medical and surgical services was gradually established so that about 7 consultations were being sent to the psychiatrists daily. In addition there were always consultations from outside units. Some of the "mysticism" frequently cloaking psychiatric work in the minds of other doctors was removed by having psychiatric patients on their own wards whose problems they were able to discuss freely with the psychiatrists. It is believed that teaching the principles of psychiatry and psychosomatic medicine to the medical officers on the other services was both an appreciated as well as an important function of this psychiatric service. The importance of situational and psychogenic factors in causing illness was thus seen by the other medical men through consultations about their own patients. As a result of this liaison the other medical men developed greater facility in diagnosing, treating and returning to duty those on their own services who had psychologic factors in their illness. Numerous unofficial conferences between the other medical officers and the psychiatrists were held in relation to psychogenic factors in illness. An indication of the awareness by the other medical officers of psychogenic factors in illness was the fact that well over 150 consultations were held in the month of December. We became well aware of the fact that the admission rate of patients to a psychiatric treatment center is no way reflected the large incidence of disease of psychologic origin, for the medical and surgical services saw large numbers of self-inflicted wounds, "cold feet," gastrointestinal reactions and other psychosomatic diseases.

*Liaison with division psychiatrists.* Almost all psychiatrists in Korea were known to one another and the division psychiatrists would occasionally come to the 4th Field Hospital where mutual problems could be discussed. In this way those of us on the psychiatric service at the 4th Field Hospital knew and appreciated some of the problems and difficulties of the division psychiatrists. For example, some of the division psychiatrists at times had a difficult time obtaining sufficient holding beds in clearing stations. We were aware of increased admission rates from divisions at these times. This of course played a part in our record for returning large numbers of patients to duty. If the division psychiatrists had been able to hold patients longer in some instances they would have been able to return them to duty before they reached this level.

*Days of hospitalization and disposition.* The average hospital stay of patients was 2 to 3 days. From 65 to 70 percent of them were returned to duty, of which about 45 percent went to full duty and the rest to limited duty. About 10 percent went to Pusan or to a hospital ship during early December when the situation was so fluid that any patients needing more than one day of hospitalization (about 23 percent) were evacuated to Japan. Among the factors influencing the large number of returns to duty as compared to those in World War II, was the fact that although the treatment center was often 200 miles from the front, the

rapidity of transportation by air was such that there was no long slow trip back to a treatment center behind the division clearing stations. This time could have been adequate for the fixing of some symptoms. Also because the discomforts are inherent to *all* parts of Korea combat area or not, secondary gain factors were lessened. Lastly the stay of only 2 or 3 days in the hospital decreases the time during which secondary gain might develop.



# Oral Rehabilitation

William S. Kramer *Captain, DC, U. S. A. (1)*

**O**RAL rehabilitation may be defined as the restoration of the jaws muscles and teeth to a normal relationship and the rebuilding of the existing occlusion to a harmonious pattern (2,3). From this definition it can be seen that we are interested in more than just the replacement of a missing tooth or the filling in of edentulous areas. The mouth must be considered as a whole and in relation to the rest of the body since it has a definite function to perform in the digestive process. We now recognize that the harm caused by the loss of one or more teeth is not limited to the dental apparatus, but may result in impaired hearing, frequent headaches, temporomandibular joint disturbances, and gastrointestinal disturbances.

Complete oral rehabilitation is a complex part of prosthetic dentistry requiring a knowledge of every phase of dentistry. It involves long and tedious procedures which are trying to both patient and dentist. The patient should be fully informed of the difficulties of the task and must be willing to accept the final outcome. In no event should the dentist give any guarantee as to the success of the undertaking. This type of work should not be attempted on patients who are high strung or very tense.

Before any work is begun, a thorough study of the case must be made so that an accurate diagnosis and treatment plan can be presented to the patient. This should include

1. A complete set of radiographs including bite-wings. These will give us a great deal of information as to the size, shape and position of the roots and also the condition of the supporting structures of the teeth. Those teeth with bifurcation and trifurcation involvement should be removed, as should teeth which have lost more than one-half their bone support. Infected teeth which cannot be treated successfully by endodontic or surgical procedures should also be removed. All cavities should be filled before any of the other work is begun. Because extensive reconstruction is contemplated doubtful teeth should be ex-

(1) Camp Gordon, Ga.

(2) Schwartz, J. M.: *Restoral Dentistry*. Th. C. V. Mosby Co., St. Louis, Mo., 1947 p. 237.

(3) Tylman, S. D.: *Theory and Practice of Crowns and Bridge Prosthesis*. 2d edition. Th. C. V. Mosby Co., St. Louis, Mo., 1947 pp. 909-910.

tracted beforehand rather than having them cause trouble after the treatment is completed.

2. A set of study models and a duplicate set of usual models should be constructed. The study models will provide a good picture of the mouth and existing occlusion and thus aid in making a proper diagnosis. The visual models are used to show the patient what is to be accomplished and what the finished case will look like. If gold will be visible the model can be painted with gold paint. Teeth which are to receive jacks can be rebuilt with white wax. Posterior teeth which are to be built up can be shown with inlay wax.

3. The mobility of all the teeth should be determined and recorded. This should be done with a mirror and explorer or other instruments rather than the operator's fingers in order to obtain a truer picture. Mobility is classified as follows (4):

A *number 1 mobility* is applied to those teeth which can be moved buccolingually about 1 mm.

A *number 2 mobility* is applied to those teeth which can be moved more than 1 mm, but cannot be depressed or rotated in their sockets.

A *number 3 mobility* is applied to those teeth which can be depressed and rotated in their sockets. Such teeth should be removed.

4. Vitality tests should be made on all suspicious teeth and teeth with large restorations.

5. The condition of the gums and supporting structures must be carefully noted because most of the patients will show some degree of periodontal disease.

6. The general health and occupation of the patient should be taken into account.

7. The type of occlusion present should be determined. In rehabilitation work, occlusion is classified (5) as:

(a) *Normal overbite.* In this bite the incisal edges of the upper teeth overlap the lower teeth slightly and the mandible can go through its various excursions with ease.

(b) *Deep overbite.* In this type of bite the incisal edges of the upper teeth overlap the lower teeth to a great extent, sometimes obliterating them from view when the teeth are in centric relation.

When we are dealing with deep overbite (3), we must determine whether it is caused by an over-eruption of the anterior teeth or an under-

(4) Miller, S. C.: *Textbook of Periodontia*, 2d edition. The Blakiston Co., Philadelphia, Pa., 1943. Chap. 4, p. 103.

(5) Miller, S. C.: *Oral Diagnosis and Treatment Planning*. The Blakiston Co., Philadelphia, Pa., 1943. pp. 163-165.

eruption of the posterior teeth, or a combination of both. If it is caused by an over-eruption of the anterior teeth, we can usually correct it by judicious grinding of these teeth. If it is caused by the failure of the posterior teeth to erupt sufficiently then we must build these teeth to such a plane that they can move freely in the various mandibular excursions but we must be careful not to impinge on the freeway space.

(c) *The prognathic bite* This is usually treated by increasing the vertical dimension so that we will have freedom in lateral excursion.

(d) *The edge-to-edge bite.* This type of bite is caused by attrition and in most instances lends itself well to rehabilitation procedures because it is usually associated with excellent bone support. We must be sure however that we maintain the edge-to-edge bite in the finished case or we are doomed to failure. Any attempt to convert this type to an overbite will result in labial movement of the anterior teeth accompanied by bone destruction and early loss of these teeth.

We have heard the term bite-raising used frequently. This is a misnomer. We do not raise the bite because by doing so we interfere with the freeway space. We do restore lost vertical dimension within the limits set by the freeway space.

It would be well here to explain and define some of the more important terms used in rehabilitation so that we will understand what the freeway space represents and how we can determine it.

*Centric relation* is that relationship existing between the upper and lower jaws when the mandible is in its most retruded unstrained position with the heads of the condyles in the glenoid fossas at any given opening from which lateral movements can be made.

*Centric occlusion* is that relationship existing between the upper and lower jaws when the teeth are closed so that maximal occlusal contact is obtained. This is a comfortable position which the patient habitually assumes over a period of time and it may or may not be the same as centric relation.

*Rest position* is the position of the mandible when it is involuntarily suspended by the reciprocal coordination of the muscles of mastication and the depressor muscles with the upper and lower teeth separated (6). This position is constant throughout life and is the point from which all mandibular movements begin, therefore it is the logical position from which to analyze any malrelationship of the jaws and malocclusion of the teeth.

*The freeway space* is the difference between the rest position and centric relation. It usually averages about 3 mm. in the central incisor region.

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(6) N. Wanger, M. D.: Rest position of mandible at rest of man. J. Am. Dent. A. 17:72-1302, Sept. 1934.



Any attempt to interfere with the freeway space by raising the bite will result in failure because the patient will develop clamping and grinding habits causing the teeth to be depressed in their sockets with possible resultant periodontoclasia. Because the rest position and the freeway space are so important to us we must be able accurately to determine these positions if our treatment is to be successful. There are two methods by which we can make these determinations (7).

*The roentgenographic method* requires great skill and expensive equipment and is therefore limited in its use. Many dentists claim that this method is not accurate because it is difficult to obtain good plates of the temporomandibular joint for purposes of measurements.

*The clinical method* on the other hand although not as scientific requires little equipment and only a little practice and patience. The patient is seated erectly without the use of the headrest and is asked to repeat the letter M. We observe the position of the mandible at the conclusion of the sounding while the lips are slightly parted. This is the rest position of the mandible. The lips can then be gently parted and the amount of freeway space observed. This procedure should be repeated until we are certain that our determination is correct. Now we are ready to fix this position so that we can transfer the relationship to an articulator. With the mandible in the rest position a small amount of fast setting plaster is placed between the anterior teeth. When this hardens the procedure is repeated in both posterior regions. The 3 indexes are then removed from the mouth placed on our models and the case then mounted in the articulator.

We are now ready to make a diagnosis and plan the treatment. Before beginning the restorative work we must equilibrate the existing occlusion. Many cases which seem to be difficult will present an entirely different picture after this has been done. The procedure to be followed in the equilibration of the existing occlusion is briefly as follows (8):

1. We first correct premature contacts in centric occlusion. If the contact is in centric only then the fossa is deepened. If the prematurity exists in lateral excursion as well as centric then the cusp is ground.

2. Next we grind premature contact in protrusive position. We try to have as many anterior teeth in contact as possible in this position. If we get some posterior contact so much the better but we do not grind the anterior teeth for the purpose of obtaining posterior contact in this position. We also shape the anterior teeth for aesthetic purposes.

(7) Thompson, J. R. Rest position of mandible and significance to dental practice. *J. Am. Dent. Ass.* 33: 151-150, Feb. 1945.

(8) See Chap 10 of text for references (4).

3 The third step is to remove premature contacts in protrusive relation so that we have a free movement from centric to protrusive relation. Our grinding is confined to the area from, but not including centric contact to the incisal edges of the upper teeth otherwise we may disocclude the teeth in centric occlusion. We follow the rule BU-LL which means grind the buccal surface of the upper and the lingual surface of the lower teeth

4 The last step in the procedure is grinding in lateral excursions and for this purpose we also follow the rule BU-LL. It is advisable but not imperative that contact be obtained on the balancing side but on the working side contact is imperative. We do not have to have a three point contact as in grinding artificial dentures.

The equilibration should be accomplished in several visits and grinding should be done conservatively because a great deal of damage may result from too much grinding. We are now ready to begin the reconstructive work. It is not my purpose in this article to describe any definite technic because that varies with each case but the following points are important (1) we usually start with the lower jaw establish an even plane of occlusion at the desired height and build the upper teeth to meet the lower (2) we must distribute the stress over as many teeth as possible in each excursion (3) our abutments are either three-quarter crowns or some type of full coverage (4) inlays are never used as abutments (5) cantilever bridges are never used except in replacing a lateral incisor (6) splinting of teeth is used if periodontal involvement is present (7) pontics are given a bullet nosed shape so that food can be easily pushed through (8) posterior restorations and abutments are constructed at a reduced buccolingual diameter so that the stress of mastication is brought further over the center of the root because that is where the tooth can withstand the greatest amount of strain (9) the height of the cusps is determined by the age of the patient, but usually we do not exceed a 20° cusp or we may have interference in lateral excursions (10) never restore lost vertical dimension on partial dentures only—a fixed stop must be provided (11) gold biting surfaces are used on posterior teeth and we should have enough thickness to allow for any grinding which may be necessary (12) periodontal treatment is necessary before during and after the work and (13) we must impress on the patient the importance of home care and periodic checkups



# Congenital Facial Diplegia

Charles Van Buskirk *Lieutenant, junior grade MC U S N R*

THE syndrome of bilateral facial paralysis is well known and many cases have been reported in the literature. The bilateral weakness is quite variable in extent and it is most frequently associated with anomalies of the other motor cranial nerves particularly the nerves of the extraocular muscles. The combination of facial weakness and extraocular muscle weakness has been called Mobius's syndrome. This syndrome in addition to the facial diplegia includes paralysis of the extraocular rotator muscles. Thomas (1) and Bonar and Owens (2) pointed out that a pure facial weakness without other anomalies of nonobstetric origin was quite unusual.

Henderson (3) was able to find only 61 cases of the syndrome. The extent of complete facial paralysis was studied in this series and it was noted that out of the whole series only 19 patients had complete paralysis of all quadrants of the facial musculature. 13 had complete paralysis of only the upper quadrants and only 1 had complete paralysis confined to the lower quadrants. Three had complete paralysis of only one side of the face and 10 had no complete paralysis of the facial musculature. Of these 61 patients 45 had associated bilateral paralysis of the abducens nerve. 15 had involvement of the oculomotor nerve. 18 had weakness of the hypoglossal nerve and 4 had involvement of the trigeminal nerve. The 4 patients with weakness of the trigeminal nerve had only partial weakness and this was of a minor degree interfering only in lateral motion of the jaws. Davis (4) found 21 cases in the literature in addition to those cited by Henderson and added 1 of his own. None of these showed any involvement of the trigeminal nerve. Hicks (5) and Murphy and German

(1) Thom, A. H. M.: Congenital facial paralysis. *J. Nerv. & Ment. Dis.* 25: 571-593, 1898.

(2) Bonar, B. E., and Owens, R. W.: Bilateral congenital facial paralysis: review of literature and classification. *Am. J. Dis. Child.* 38: 1256-1272, Dec. 1929.

(3) Henderson, J. L. (Edinburgh): Congenital facial diplegia syndrome; clinical features, pathology and aetiology: review of 61 cases. *Brain* 62: 381-403 Dec. 1939.

(4) Davis, P.: Les paralysies oculo-faciales congenitales. (A propos de trois observations nouvelles.) *Ophthalmologica* 110: 113-137 Sept.-Oct. 1945.

(5) Hicks, A. M.: Congenital paralysis of lateral rotators of eye with paralysis of muscles of face. *Arch. Ophth.* 30: 38-42, July 1943.

(6) reported 5 more patients with congenital facial diplegia 1 of whom showed some involvement of the trigeminal nerve. This was expressed only by slight deviation of the jaw with no weakness of the masseter muscle.

### CASE REPORT

Soon after the birth of a 9-month-old girl, whose delivery was by low forceps, it was noted that she had difficulty in feeding because the mouth could not be closed voluntarily. Following the delivery, which was not difficult, there were no marks of trauma. The birth weight was 7 pounds 3 ounces. The baby soon learned to nurse in spite of her handicap by using the tongue, and later would use the hands to push the lower jaw upward to close the mouth. General development as to intelligence, weight, and learning were normal. There was no family history of anomalies. Physical examination revealed deep temporal fossas. There was a bilateral weakness of the abducens nerve with nystagmus on looking to the side. Bilateral epicanthus was present but no ptosis was noted (fig. 1). The baby could close



Figure 1

the eyes but there was marked weakness of the facial muscles bilaterally. The tongue was normal. The jaw could not be closed voluntarily and no masseter muscle could be palpated. The corneal reflex was present on the right side but absent on the left. The baby had been occasionally noted by the mother to pull up the right corner of the mouth slightly. Innervation to this part of the face was confirmed by electric stimulation. Faradic stimulation could produce contraction of the muscles of the right side of the face, both upper and lower groups. Neither strong faradic nor galvanic stimulation could produce any response in the muscles of the left side of the face or of any of the muscles of mastication. Roentgenograms of the skull, spine, and pelvis were normal. The electroencephalogram was normal.

(6) Murphy, J. P., and German, W. J.: Congenital facial paralysis. *Arch. Neurol. & Psychiat.* 57: 358-361, Mar. 1947.

## DISCUSSION

The case presented here is considered unusual in that there is complete bilateral paralysis of the muscles of mastication. The literature reveals out of a total of 88 reported patients with congenital facial diplegia only 5 in whom there was trigeminal involvement and in all it was only of a minor nature not interfering seriously with mastication. Other anomalies of the body are frequently associated with the facial diplegia. Henderson's review included 19 patients with clubfoot, 13 with deformity of the upper extremity and 8 with a pectoralis muscle deformity. Schapfanger (7) found such additional anomalies as a protuberant glabella, bilateral epicanthus, deformity of the terminal phalanx of the left index finger, bifid uvula and a sunken sternum. Fry and Kasak (8) found associated with their patient an anomaly of the left hand, an absent left breast, and a family history of congenital anomalies. Hicks noted web fingers in one of his four patients. Gifford (9) found defective sternocleidomastoid and scapular muscles. My patient revealed no anomalies other than bilateral epicanthus.

Henderson, Davis and Bonar and Owens concluded after their respective reviews that congenital diplegia is characterized by small or absent motor nuclei for the facial nerve and associated anomalous cranial nerves with small or absent nerve roots. These conclusions however are based essentially on one report by Heubner (10) of an anatomic examination of a patient with congenital diplegia who came to autopsy. The patient reported by Murphy and German is of interest in that an air encephalogram was performed. This revealed enlarged basal cisterns particularly the cisterna pontis, cisterna interpeduncularis and cisterna chiasmatica. The distance from the ventral margin of the pons to the floor of the fourth ventricle was less than normal. These findings suggested hypoplasia of the pons and brain stem. Apparently the primary process resulting in the syndrome is agenesis of the motor nuclei of the cranial nerves involved. What factors are present to produce such agenesis remain unknown.

(7) Schapfanger, A.: Case report. *Boston M. & S. J.* pp. 635-636, 1889.

(8) Fry, F. R., and Kasak, M.: Congenital facial paralysis. *Arch. Neurol. & Psychiat.* 21: 636-644, Dec. 1919.

(9) Gifford, H.: Congenital defects of abduction and other ocular movement and their relation to birth injury. *Am. J. Ophth.* 9: 3-22, Jan. 1926.

(10) Heubner, O. (1900): Cited in (2) 31.



# Sacrococcygeal Teratoma

Paul C. LeGovan, *Lieutenant Colonel, MC, U S A. (1)*

Kenneth F. Ernst, *Colonel, MC, U S A. (1)*

**T**ERATOMAS of the sacrococcygeal area constitute an interesting group of tumors and although they are not rare the occurrence of malignancy in them is an important factor to consider in their treatment. In the case to be reported malignancy was demonstrated

## CASE REPORT

At birth this girl had a small mass at the base of the spine and an adjacent but separate mass in the right buttock. The opinion when she was 1 month of age was that the mass at the base of the spine represented a meningocele and that no surgical intervention was indicated for a period of from 6 to 12 months. No record was made of the initial impressions concerning the mass in the buttock. At 2 months of age the child developed meningitis and was readmitted to the hospital for treatment. No organisms were recovered from the spinal fluid and although it was thought that this meningitis was probably secondary to infection of the mass in the buttock, aspiration yielded no pus. At this time also a cord bladder was noted which required an indwelling catheter. The mass at the base of the spine was the size of a walnut, blue-gray and fluctuant. A dye injected into the lumbar subarachnoid space was recovered by aspiration from this mass. A portion of the mass in the buttock 1 cm. in diameter was removed for microscopic examination.

Considering the size and location of the mass in the buttock, the presence of the meningocele and the child's general condition, surgical removal was believed contraindicated so the child was returned to her parents. She developed a persistent urinary tract infection, bilateral edema of the legs and gradual increase in the size of the mass in the buttock. Firm subcutaneous lumps appeared over the back when she was about 18 months of age and a roentgenogram of the chest taken when she was 20 months of age revealed nodular densities scattered throughout both lungs which were interpreted as metastatic lesions. Marked emaciation developed and the child died at 2 years of age.

(1) Letterman Army Hospital, San Francisco, Calif



Laboratory data during this child's hospitalization were not contributory other than to reflect the urinary tract infection, meningitis and a gradually progressive anemia.

**Gross pathologic findings** At autopsy the large ulcerated mass (fig. 1) was removed from the right buttock with difficulty and found to consist of soft, pale gray tissue intermixed with numerous small pockets containing thick creamy and hemorrhagic fluid. The mass was not encapsulated and had destroyed much of the sacrum, ilium, and lumbar spine and had extended into the retroperitoneal area of the pelvis and abdomen with marked displacement of organs although there was no actual invasion of them nor was seeding present on the peritoneum. The tumor had invaded the inferior vena cava and pelvic veins but

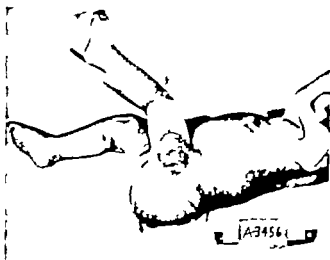


Figure 1. Photograph showing the mass in the buttock and marked emaciation of the child at time of death.

not the aorta. The presence or absence of sperm bifida could not be ascertained. There were metastases to the pelvic and abdominal parietal lymph nodes, the liver and the lungs. The spinal cord below the lower thoracic region was surrounded extracranially by tumor without cranial invasion and the cauda equina was inseparably enmeshed in tumor tissue. The metastatic lesions in the lungs and liver were well circumscribed and necrosis was present only in the larger lesions. No other source of tumor other than the lesion in the buttock, could be demonstrated.

**Microscopic finding** The biopsy specimen (fig. 2) consisted of neural tissue intermixed with vari-sized trabeculae of well vascularized connective tissue. The neural element was identified by the presence of neurons and neuroglia. The neurons had large round, vesicular nuclei each containing a large nucleolus and distinct nuclear membrane. The cytoplasm contained varying quantities of Nissl substance. The



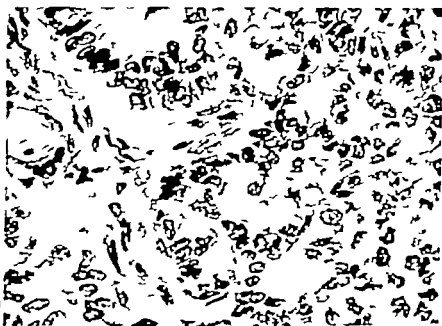
Figure 2. Section of biopsy specimen showing neural elements and the fibrous trabeculae.

cell bodies varied in size and shape and processes were present. The neuroglia were identified as astrocytes, oligodendroglia and microglia. The astrocytes had large oval, pale vesicular nuclei, the oligodendroglia had smaller more darkly staining nuclei and a clear cytoplasm. The fibrous trabeculae were of varying lengths and widths and contained rounded, contoured, purple crystalline bodies. The ependyma was not identified with certainty. Large and small rounded spaces were seen, surrounded by flattened histiocytes, and foreign body giant



Figure 3. Section from biopsy specimen showing stratified ciliated columnar epithelium and mucus-producing glands.

cells were present around the smaller spaces. Fat stains proved the presence of lipid within these spaces. Some sections of the main mass in the buttock were similar to those prepared from the biopsy specimen, with the exceptions that fibrous trabeculae were more numerous, larger, and sections of the autopsy specimen showed much greater postmortem autolytic change. In addition, ductlike and cystic spaces lined by stratified ciliated columnar epithelium, stratified squamous epithelium, or mucus-producing epithelium were present (fig. 3). Other sections presented an entirely different appearance. There was a cellular tissue which presented a varied pattern, occurring either in solid sheets or as a beaded, lacelike alveolar ductal, or papillary growth (fig. 4).



*Figure 4. Malignant element of the tumor*

There was necrosis in the solid area with central loss of tissue. Perivascular cuffing was occasionally present, but no true rosettes were found. The cells extended along fibrous septums generally respecting these barriers. The cells had indefinite cytoplasmic borders, stained slightly basophilically, and had oval, large, vesicular nuclei without nucleoli. When the ductal pattern was present the cells were columnar or cuboidal. There was slight cellular and nuclear variation. No hyperchromatism was present and mitoses could be found, but were not numerous. No intracytoplasmic nor intranuclear inclusions were demonstrated. The metastases were similar in appearance to the main tumor.

## COMMENT

The malignant element was very suggestive of ependyma both in cellular morphology and growth pattern but blepharoplasts could not be demonstrated. Gross et al. (2) in a report of 40 sacrococcygeal teratomas in infants and children found that 11 exhibited histologically malignant characteristics. Riker and Potts (3) in a report of 6 cases of sacrococcygeal teratoma reported malignancy and recurrence in 2 and probably in a third. Lisco (4) reported 2 cases with malignancy and collected 10 similar cases from the literature.

In the 12 cases analyzed by Lisco (4) metastases occurred to the lungs in 8, to lymph nodes in 8, and to the liver in 5. The type of malignancy was described as papillary adenocarcinoma in 6, adenocarcinoma in 2, carcinoma in 1, embryonal carcinoma in 1, alveolar sarcoma in 1, and chondrosarcoma in 1. All died within about 3 years of birth. In those cases reported by Gross et al. which exhibited histologically malignant characteristics, 7 had evidence of invasion or metastases. The sites of metastases were not broken down statistically but they were to lymph nodes, liver, lungs, or distant bones. Histologically the malignant elements were classified as embryoma in 4, papillary adenocarcinoma in 4, as malignant neural tissue or neuroblastoma in 2, and rhabdomyosarcoma in 1.

In comparing this case with the others it is probably best classified as adenocarcinoma and in its behavior fits well with the reported cases as a whole. If those cases classified as adenocarcinoma, carcinoma, or embryonal carcinoma could be studied and compared histologically they would probably be found to have a very similar cellular and growth pattern. It is striking how closely the malignant elements in those cases illustrated in the literature resemble one another. This case emphasizes the need for adequate early surgical removal of all teratomatous sacrococcygeal growths whenever possible and also stresses the observation made by Gross et al. (2) that recurrences are more likely in those teratomas composed predominantly of neural elements.

(2) Gross R. E.; Clatworthy H. V.; and Meeker I. A. Sacrococcygeal teratomas in infants and children. *Surg. Gynec. & Obst.* 92: 341-354, Mar. 1951.

(3) Riker W., and Potts, W. J. Sacrococcygeal teratomata in infancy: report of 6 cases. *Ann. Surg.* 128: 89-100, July 1948.

(4) Lisco, H. Malignant tumor developing in sacrococcygeal teratomata. *Ann. Surg.* 115: 378-389, Mar. 1942.



# Herpes Zoster Following German Measles

Paul E. Wright, Major U S A F (MC) (1)

Erwin G. Pear, Captain, U S A F R (MC) (1)

William L. Semler, Captain, U S A F (MC) (1)

**F**OR some time a close relationship has been thought to exist between the viruses of chickenpox and herpes zoster. We therefore believed that our case of herpes zoster which followed an attack of German measles was unusual enough to warrant reporting.

## CASE REPORT

On 30 March 1951 a 19-year-old Negro reported on sick call complaining of headache and tenderness behind his left ear for the past 24 hours. The patient stated that 3 days prior to admission he had noted a tender swelling in his left axilla which gradually disappeared as his headache developed. With the onset of his headache and tenderness behind his ear he had noted a mild sore throat and some discomfort of his eyes.

Physical examination revealed mild, bilateral conjunctival injection; moderately enlarged hyperemic tonsils; hyperemia of his pharynx; two small slightly tender left postarticular nodes and a morbilliform rash of the upper anterior portion of the thorax. The rash was not easily seen but could be demonstrated by a light held parallel to the surface of the chest. The patient's temperature was normal.

At the time of his admission 5 cases of German measles had been diagnosed among the airmen of the base and several cases existed among the dependents. The conditions to be differentiated in this patient were tonsillitis with pharyngitis, German measles and infectious mononucleosis which was ruled out by a negative heterophile antibody report. The patient was placed on bed rest, given a soft diet and supportive therapy. As prophylaxis against severe tonsillitis he was given 300,000 units of procaine penicillin daily for 3 days. The day following admission only a minimal conjunctivitis remained in the left eye.

(1) Olmsted Air Force Base, Middletown, Pa.

*Figure 2.**Figure 1.*

and the rash had almost completely faded. On the morning of the fourth day in the hospital his temperature which had been normal since admission, rose to  $101^{\circ}\text{F}$  and he complained of pain in his left eye and of his left eyelid. Herpes was considered. A consultation with a civilian ophthalmologist confirmed this diagnosis. Within 24 hours the patient developed typical blebs over the distribution of the frontal branch of the ophthalmic division of the trigeminal nerve. He was given 500 mg. of chloramphenicol every 6 hours. On the following day, the sixth day of hospitalization, the herpetic lesions were larger, his left eyelid was swollen shut and he complained of pain on the surface of the left eye (fig. 1). Cortisone eyedrops were then given. Toward evening of the same day about a dozen vesicles were seen on the left side of the chest, roughly following the distribution of the intercostal nerves. By the eighth hospital day the herpetic lesions were drying and crusting. The patient no longer complained of pain in his eye. On the tenth day he left on an emergency furlough. He was not seen again until 1 May when he reported on sick call complaining of pain in his right eye. He was immediately seen by an ophthalmologist, and a diagnosis of acute iritis was made. At that time it was also noted that there was ptosis of the left upper eyelid. This was considered a residual of the recent attack of herpes zoster. Scarring of the left cornea was also noted and was also believed to be a residual of the herpes zoster. The patient was admitted to the hospital and given chloramphenicol and aureomycin. It was observed that in the 22 days between his discharge and his readmission there had been a moderate loss of hair of the area previously involved with the herpetic lesions (fig. 2).

He was treated for 7 days. By the fifth day most of his signs and symptoms had receded. He was discharged cured on the twelfth hospital day. At that time there was still a slight ptosis of the left eyelid and hyperpigmented scarring of the left side of the forehead and left upper eyelid. The hair over the anterior left quadrant of the scalp had grown out almost completely.

#### CONCLUSION

Considering the vagueness surrounding the cause of iritis, it is postulated that after lying dormant for about 3 weeks the patient had a recurrence of his herpes zoster. No relationship between herpes zoster and German measles is implied.





# Use of Methergine in Vaginal Delivery<sup>1</sup>

Robert J. Carpenter Jr. M. D.<sup>2</sup>

**M**ETHERGINE (methyletergonovine tartrate) a semisynthetic ergot alkaloid, has been described pharmacologically and clinically by several authors in recent years. The opinions have been crystallized by Priver et al.<sup>3</sup> who stated that methergine has a more pronounced and sustained effect than natural ergonovine and that it is about twice as potent. Fifty patients were selected for this study the only criteria being the presence of a single full-term pregnancy in vertex presentation. Spontaneous low forceps and midforceps deliveries were included. Nitrous oxide-oxygen-ether anesthesia was employed in two-thirds of the patients, spinal anesthesia in one third and 1 patient received sodium pentothal.

*Method.* One cubic centimeter of methergine was given intravenously simultaneously with the birth of the anterior shoulder the needle having been previously inserted in an antecubital vein by a nurse or intern. Following this the observer placed a hand on the fundus and the time from the injection to the contraction of the uterus was noted. From 30 to 60 seconds were allowed to elapse for the birth of the remainder of the baby. The reason for this procedure was that the baby's body holds the lower uterine segment and cervix open, permitting contraction of the upper segment, the disproportion in size thus created facilitating the separation of the placenta. With the lower segment held open the placenta rarely if ever becomes trapped. It has also been shown that this uterine contraction may contribute to decreasing the amount of blood in the cord and placenta thus making more blood available to the baby.

Other workers have shown that methergine is safe. Side reactions such as nausea, vomiting and transient hypertension are significantly

<sup>1</sup>From the Department of Obstetrics, Ellis Hospital, Schenectady, N. Y.

<sup>2</sup>Formerly Captain MC, A. U. S.; now in Springfield, Mass.

<sup>3</sup>Priver, M. S., et al., Intravenous use of methergine in intrapartum care. *W. J. Surg.* 57: 586-588, Dec. 1949.

minimized. In this series no other oxytocic drug was administered on the day of delivery although the patients received 0.25 mg. of methergin by mouth *t. i. d.* for the first 3 postpartum days.

**Results.** The elapsed time from the birth of the baby to birth of the placenta ranged from 1 second to 4 minutes (table 1). In a few cases the placenta followed immediately on the baby's feet and in the remainder it was expressed with or during the first contraction aided by gentle traction of the presenting edge in the cervix.

TABLE 1. Time required for delivery of placenta

Number of minutes	0-1/2	1/2-1	1-2	2-4
Number of patients	3	7	16	24

The initial contraction of the uterus followed the intravenous dose in from 25 to 70 seconds. The largest blood loss measured was 275 cc following a large mediolateral episiotomy. In the group of deliveries without episiotomy or with a small midline episiotomy the blood loss measured from 40 to 75 cc (table 2). Episiotomy apparently is a large factor in the greater blood losses. No unusual side reactions were

TABLE 2. Estimated blood loss

Number of cc.	0-50	51-100	101-200	ex 200
Number of patients	16	24	9	1

noted. Secondary relaxation of the uterus causing further blood loss was not seen.

### CONCLUSION

Methergin apparently is a safe oxytocic and when used as described an important factor in minimizing blood loss at vaginal delivery.

# Violent or Clinically Unexplained Deaths

William F Epps Jr Major MC, U. S. A. (1)

James L. Hansen Lieutenant Colonel MC, U. S. A. (1)

**I**N THE Armed Forces as in civil life it is important to investigate thoroughly cases of violent or clinically unexplained deaths. In all such situations many factors such as foul play gross negligence line of duty status and public health have to be considered (2).

Fifty-nine cases of violent or clinically unexplained deaths were recently reviewed in this laboratory. These deaths occurred between 1 January 1950 and 31 July 1951. Deaths of adults only were included in the study. There were 21 deaths from injuries sustained in motor vehicle accidents, 11 from miscellaneous causes, 11 from diseases of the respiratory system, 11 suicides, 3 from neoplastic lesions, 1 homicide and 1 from injuries sustained in an airplane accident.

The 3 clinically unexplained deaths caused by neoplastic lesions are of interest. The first case a 17-year-old boy entered the hospital complaining of pain and burning sensation of 4 months duration in the substernal region. Percussion on admission revealed the heart to be enlarged to the left and a loud, harsh systolic murmur which was transmitted into the axilla was heard in the mitral area. Laboratory examinations were essentially negative. Roentgenograms of the chest showed the heart shadow to be within normal limits. The admission diagnoses were bronchitis and valvulitis. The patient was treated with antibiotics and supportive therapy. While hospitalized he suffered occasional bouts of cyanosis and dyspnea. In one attack which occurred while the patient was having a bowel movement he experienced severe substernal pain, became extremely pale, dyspneic and died. Autopsy findings revealed a fibroma of the left atrium of the heart.

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(1) First Army Area Medical Laboratory, New York, N. Y.

(2) Field, R., Medical Investigation of Violent and Unexplained Deaths. J. A. M. A. 145: 1027-1030, April 7, 1951.

The second patient was a 22-year-old white man who had been in the Army 3 weeks. Throughout this time he complained of constant, sharp epigastric pain, nausea and vomiting which occurred usually after meals. He was admitted to the hospital with a temperature of 99° F. On physical examination the liver was greatly enlarged and tender. The impression at the time of admission was acute infectious hepatitis with jaundice. Later, roentgenograms of the lungs revealed lesions which suggested metastatic carcinoma. At autopsy a chorio-epithelioma widely disseminated throughout the body was found.

The third patient was a 46-year-old man who reported to the out-patient clinic 13 days prior to his death, complaining of headache, vomiting, vertigo, and insomnia of about 4 months duration. He appeared to be somewhat lethargic and disoriented and had a slight paralysis of the left side of the face. Impression at that time was migraine headache or possibly encephalitis. He was hospitalized for 10 days during which time he was given codeine and acetylsalicylic acid, small doses of meperidine hydrochloride and small doses of secenal. The discharge diagnosis was histamin headaches. At the time of discharge he still complained of severe headaches and occasional vomiting and was given twenty-three 1 mg. capsules of cafergone to take with him. He returned 2 days later for more of these capsules but was given a placebo instead. On the following day he fainted in his barracks and was brought unconscious to the hospital. He was pale but not cyanotic, with a pulse of 64 and a blood pressure of 140/78. Other than marked carpopedal spasm bilaterally the physical examination was negative. Two hours after entering the hospital he suddenly showed signs of acute respiratory distress and died 45 minutes after the onset of this attack. Autopsy revealed a glioblastoma multiforme of the right frontal lobe.

Six of the 8 cases of death caused by disease of the respiratory system were found to have histopathologic changes compatible with influenza pneumonia. Unfortunately viral studies were not performed on any of these patients. Three of them are of great interest and emphasize the possible violence of influenza pneumonia.

One patient, 23-year-old Negro, entered the dispensary complaining of back pains. He associated this complaint with some heavy lifting he had done on the previous day. He had no fever and physical examination revealed no abnormalities. A roentgenogram of the lumbar spine was taken but the patient was discharged pending its evaluation. He was found dead in his bunk on the following morning. Autopsy revealed hemorrhagic bronchopneumonia, probably of viral or germ.

The second patient, a 20-year-old man, entered the hospital complaining of cough and hemoptysis of 1 week's duration. On admission he was found to have a temperature of 101.6° F. Bubbling rales were heard in both lungs. He was placed on antibiotic therapy but died 5 hours after admission. The autopsy suggested viral pneumonitis.

The third patient was a 19-year-old Negro who was in an automobile accident while on furlough. He sustained no apparent injuries. Thirty-six hours after the accident he suddenly became ill and died shortly thereafter. A complete autopsy failed to reveal any signs of injury. The only positive findings were extreme congestion of both lungs which was most marked in the upper and middle lobes of the right lung and the entire left lung. The cytologic changes were compatible with a viral pneumonia.

Eleven cases of death caused by disease of the cardiovascular system were also included in the study. Four of these involved men whose ages ranged between 23 and 35 years. In three, death was caused by coronary occlusion.

In one case autopsy findings served to exonerate an innocent man. A 29-year-old soldier who had engaged in a fist fight with a recruit was found dead several hours afterward in a bivouac area. At autopsy no evidence of trauma was found but the anterior descending branch of the left coronary artery was completely occluded by an atheromatous plaque.

Another patient was a 23-year-old West Point cadet with a cough of progressive severity present since he was 12 years old. He had gradually produced more and more sputum until shortly prior to his death, at which time he was producing about 60 cc. per day. He was frequently hospitalized at West Point for upper respiratory infections. Various diagnoses including chronic bronchitis and bronchiectasis were considered although radiographic and bronchoscopic studies failed to reveal any significant changes. While playing handball he suddenly died. At autopsy the heart was found to be greatly hypertrophied and dilated. The myocardium was heavily infiltrated by epicardial fat. This case is similar to those described by Saphir and Corrigan (3) in which they found that extensive replacement of muscle fibers by fat was the only lesion present to account for the sudden death.

Brain damage and/or damage to the lungs and liver accounted for a large majority of the fatal injuries sustained in motor vehicle accidents. In 5 cases (25 percent) blood alcohol levels were found elevated above 15 mg. per ml. (4). Suicide was accomplished by carbon monoxide poisoning, self-inflicted gunshot wounds, jumping from high places and ingesting bichloride of mercury. The first two methods mentioned far outnumbered the last two.

In 9 patients the exact cause of death was not ascertained even after autopsy. These serve to re-emphasize the importance of obtaining a complete clinical history and performing thorough gross and microscopic

(3) Saphir O., and Corrigan, M.: Fatty infiltration of myocardium. *Arch. Int. Med.* 52: 410-428, Sept. 1933.

(4) Spain D. M.; Bruders V. A., and Egerton, A. A.: Alcohol and violent death; 1-year study of consecutive cases in representative community (Clinical Notes Section.) *J. A. A.* 146: 334-335 May '6 1951.

examinations as well as a toxicologic investigation. One such patient, an obese 39-year-old Negro, had been hospitalized because of possible diabetes. Laboratory findings confirmed the clinical impression. While hospitalized he was placed on diet and subsequently lost 10 pounds. On the day prior to his death his fasting blood sugar was 127 mg. per 100 cc. He left the ward without permission and was found dead in the back seat of his car. At autopsy no significant anatomic changes could be found to account for his death. The pathologist requested (1) a blood sugar determination from cardiac blood, (2) blood alcohol determination, (3) carbon dioxide combining power, (4) blood cholesterol, and (5) tests to rule out volatile and metallic poisons. The cardiac blood sugar was 207 per 100 cc, the  $\text{CO}_2$  combining power was 85 l volume per 100 cc, and the blood alcohol was 2 mg. per 100 cc.

In this patient carbon monoxide poisoning was certainly a possibility but the pathologist failed to request a carbon monoxide determination. The blood sugar determination on the cardiac blood was undoubtedly misleading. The increase of glucose in the blood of the right side of the heart because of glycolysis in the liver as well as the increase of glucose in the blood of the left side of the heart because of myocardial glycogenolysis (5) were not considered. We have frequently compared blood sugar determinations from the right and left side of the heart in accident cases and usually the determinations from the right side of the heart ranged between 250 and 350 mg. per 100 cc. The carbon dioxide combining power of 85 l volume per 100 cc. was of no significance. It would be helpful in this type of case to obtain about 15 cc. of cerebrospinal fluid by cisternal puncture in view of the fact that most post-mortem chemical determinations are more reliable when spinal fluid is used.

In all cases it is advisable to obtain stomach contents, spinal fluid, blood, urine and tissues from the brain, liver, kidney and intestine for toxicologic studies.

In other cases the cause was not ascertained because of incomplete gross and microscopic examination. For example, a 23-year-old man was admitted to the hospital complaining of difficulty in starting micturition, accompanied by an intermittent flow. While hospitalized, he suddenly went into shock and died. The pathologist rendered a report of pulmonary edema and tubular degeneration of the distals. The central nervous system was completely disregarded as possible for the primary cause of death.

Efforts to determine exact cause of sudden or unexplained deaths because of inadequate gross and/or toxicologic examinations should be limited.

(5) Naiman, H. M. Studies on postmortem chemistry. *Am. J. Clin. Path.* 74: 314-318, April 1950.

### SUMMARY

In 15 percent of 59 cases of violent or clinically unexplained death investigation, autopsy and toxicologic examinations failed to disclose a definite cause of death. This emphasizes the importance of obtaining a complete clinical history and of performing thorough gross microscopic bacteriologic, chemical and toxicologic examinations in all cases of sudden or clinically unexplained deaths.





# Demountable Tidal Drainage Apparatus<sup>(1)</sup>

John F. Carney Major MC, U. S. A.

Quinton Lindsay Sergeant, Medical Service U. S. A.

Lowrain E. McCrea, M. D. (2)

THE value of tidal drainage in the management of the neurogenic bladder is well recognized. The purpose of tidal drainage is not only repeated irrigation of the bladder but also passive exercise to the neurogenically impaired detrusor urinae muscle. The use of such equipment would undoubtedly be more general if the usually available apparatus were not so complex, inefficient, costly, fragile, and at times difficult to procure when most needed. It is the purpose of this article to describe a tidal drainage apparatus that is simple in design, of low cost, efficient in action, immediately procurable and easily assembled in any military or civilian hospital.

This equipment was conceived and designed as a unit using standard items listed in the Armed Services Catalog of Medical Material. The underlying principle is siphonage. In the use of some available types of tidal drainage apparatus much sediment collects in the bottom of the apparatus, particularly if the patient has an infection in the bladder. The sediment may flow from the apparatus into the bladder or from the bladder into the apparatus depending on the direction of flow of the irrigating fluid. For these reasons a more efficient tidal drainage apparatus seemed desirable. The apparatus here described eliminates that disadvantage.

It uses a test tube (Item 04435250) that measures 25 by 150 mm. as the reservoir. The siphon equipment consists of a glass tube (Item 4457750) measuring 6 mm. in diameter and 17.5 cm. in length, the distal end being tapered or notched. This tube is capped by a test tube (Item 0443385) measuring 13 by 20 mm. The base of the apparatus is a size 5 rubber stopper having two openings (Item 04420000). A small connecting tube bent under heat to a 90 degree angle completes the apparatus. The assembly of the equipment may be seen in figure 1.

(1) V. H. E. Army Hospital, Phoenixville, Pa.

(2) Civilian Consultant in Urology.

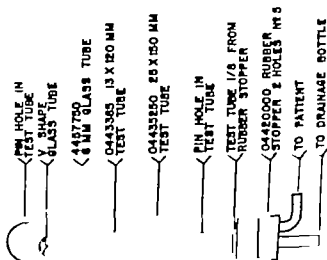


Figure 1 Schematic diagram of Lindroy tidal drainage apparatus.

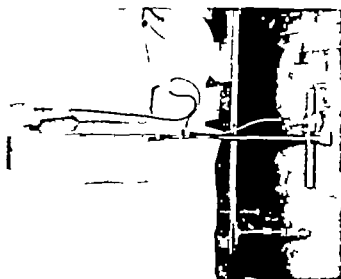
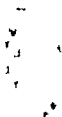


Figure 2 Lindroy tidal drainage apparatus.

A small hole is bored in the large test tube about 1.5 cm. from the base in order to maintain atmospheric pressure. A hole is also bored in the inner test tube 2.5 cm. from the mouth to break the siphon action and prevent the suction of the bladder into the catheter. The inner test tube in the assembly is supported by the siphon tube at such a level that the mouth of the test tube is about 1/8 inch above the rubber stopper. The right angle tube is inserted in the rubber stopper at such a level that it is flush with the inner surface of the stopper.

If the bladder is found to be spastic by cystometric reading the tidal equipment must be elevated to prevent constant trapping. It is connected by a glass Y tube to the indwelling catheter worn by the patient. The base of the Y tube is inserted into the catheter (fig. 2). One arm of the Y tube is connected to the irrigating container. Intravenous fluid containers may be used. The other arm of the Y tube is connected to the right angle tube of the tidal drainage apparatus. The siphon tube projects from the rubber stopper for a distance of 2.5 cm. and is connected by rubber tubing to a waste receptacle preferably of 4,000 cc. capacity. This equipment is efficient and superior to other available apparatus. The bladder is completely evacuated before the tidal reservoir is emptied. The height of the fluid in the tidal reservoir is governed by the intracystic pressure as the bladder is filled, the bladder being filled primarily and the tidal reservoir being filled secondarily. This equipment is readily demountable for cleaning and for replacing broken parts, whereas the more elaborate commercial apparatus is a fixed unit which does not permit dismantling for easy cleaning. Furthermore, if any portion of the commercial equipment is broken the entire apparatus must be discarded.



# Repair of the Flexor Pollicis Longus Tendon

Francis H. McCullough, Jr. *Lieutenant, MC U S N (1)*

**T**O GRASP an object one must press the distal joint of the thumb firmly against it and at the same moment apply counter pressure with a finger or fingers. The inability to perform this function is very disabling, particularly if the disability occurs in the dominant hand. Without the distal phalanx the thumb is too short for a good grasp. If only the long flexor tendon is cut or avulsed no pressure can be exerted in grasping although the thumb may be in a position to act, and objects cannot be held firmly. Function can be restored either by a repair of the long flexor tendon or by a stabilizing procedure on the distal joint thereby enabling the short flexor tendon to exert its force through the bone.

## CASE REPORT

A 20-year-old right handed marine was wounded by an exploding mortar shell in Korea in December 1950. Metal fragments struck his right hand causing a compound fracture of the shaft of the middle phalanx of his middle finger and a compound chip fracture on the palmar surface of the distal phalanx of his thumb at the interphalangeal joint. There was no artery or nerve involvement. He was unable to flex the distal joint of his thumb. He received penicillin for a minor infection in his middle finger and following his hospitalization the wounds healed as did the fracture of the middle finger. He was discharged from the hospital to duty although he was unable to flex the distal joint of his thumb and was unable to grasp and hold objects. Examination in February 1951 showed that he was able to initiate motion of the flexor pollicis longus tendon and that the bone chip was movable. The tendon motion was noted on the proximal side of the interphalangeal joint in the crease of the thumb. There was a full range of passive motion in the distal joint. The extensor tendon was normal as was the remainder of the thumb and hand.

It was believed that this patient's hand could be benefited by replacing the flexor pollicis longus tendon to the distal phalanx of the

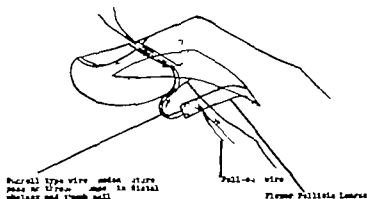


Figure 1.

thumb An operation was performed on 16 February using brachial block anesthesia. An anterolateral incision was made on either side of distal joint, following the joint crease. The joint capsule was opened laterally and the bone chip was found to be attached to the tendon sheath by a fibrous band of scar tissue on the proximal side of the joint capsule, accounting for the retraction of the tendon. The chip was grasped with an Allis clamp, the attached fibrous band was severed, and the tendon was stretched. The chip was then excised from the end of the tendon. A 0.009 wire suture was placed through the tendon with a



Figure 2. Three weeks after operation, note the position of the thumb. The tendon is holding the distal phalanx in flexion.

pull-out wire employing the Bunnell technic. With a No. 9 dental bur in a bone drill, a tunnel was made obliquely through the fingernail and the proximal one-third of the distal phalanx. Through this the suture on the tendon was passed (fig. 1). The tendon of the flexor pollicis longus

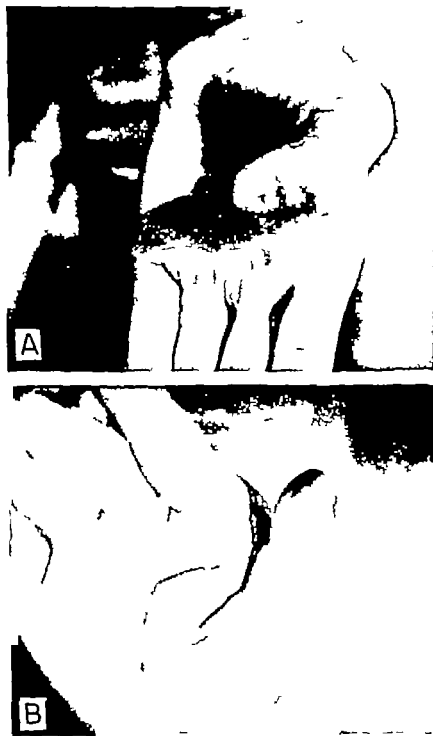


Figure 3 Degree of (A) active flexion and (B) extension obtainable 4 weeks after operation.



muscle was then pulled snugly into the bone tunnel and secured by anchoring the tendon to a button on the nail. The pull-out wire was secured by another button proximal to the incision. The joint capsule was left open after noting that the patient could initiate motion of the distal joint and that the tendon glided smoothly in the exposed sheath and capsule.

The skin was closed with interrupted wire sutures. A plaster cast was applied from below the elbow immobilizing the thumb in opposition with the distal joint flexed. The cast and sutures were removed 3 weeks later (fig. 2). The distal joint could be extended from its flexed position only a few degrees. The patient was instructed to start passive extension exercises slowly being careful not to exert too much tension while extending the joint. Four days following the removal of the cast the buttons and all internal fixation were removed by means of the pull-out wire. Four weeks after operation the patient was able to extend the distal joint of his thumb to 165° and flex it to 90° (fig. 3). He was not given any formal physiotherapy treatment but was instructed in passive and active motion to the tolerance of pain to gain full extension of the joint. The fifth week after operation he was grasping a rubber ball and pressing the ball with the thumb gradually increasing the amount of pressure by the long flexor tendon.

Six weeks after operation the distal joint of his thumb showed a full range of motion. He was able to grasp objects and hold them.

# An Unusual Cause of Negative Radiologic Shadows in the Stomach

Allan B. Ramsay *Colonel, MC U S A* (1)

Henry Thompson Jr *Major MC U S A* (1)

ON RADIOLOGIC examination of the stomach a negative shadow may be observed through the barium as a result of many types of space-occupying masses or objects. The phenomenon may be observed as a result of carcinoma leiomyoma lymphoma sarcoma, polyp aberrant pancreas bezoar enlarged gastric rugas and adjacent extrinsic lesions. All of these conditions have been discussed many times in the literature. Recently we have observed on a gastrointestinal series negative shadows produced by a surgical procedure for the closure of a perforated gastric ulcer consisting of plication of the stomach wall over the site of the rupture.

## CASE REPORT

A 30-year-old man was admitted to this hospital on 26 December 1950 with acute abdominal pain. He gave a history of gastric distress and dyspepsia which had appeared at intervals during the preceding 4 years. On 2 occasions he had had hematemesis. His distress was precipitated by eating foods usually not tolerated by patients with peptic ulcer. His symptoms were relieved by drinking milk. At 0300 hours on the date of admission he was seized with a sudden, sharp stabbing pain in the epigastrium and other clinical findings of a perforated peptic ulcer.

At operation a perforation 3 mm. in diameter was found in the anterior wall of the gastric antrum. This was surrounded by an area of induration about 5 cm. in diameter. The ruptured ulcer was closed with a single 00" chromic catgut purse-string suture and reinforced by four interrupted sutures of the same material. The stomach wall was then

---

(1) Army and Navy General Hospital, Hot Springs National Park, Ark.



Figure 1. Roentgenogram showing triangular configuration of the ear shadow during systole. Figure 2. Roentgenogram showing two separate shadows. The larger, roughly triangular shadow is the malleus in position. Figure 3. Pressure test of the diastolic phase demonstrating three shadows in the roentgenogram varying from a round to an oval shadow.

plated over the site with "0000" black silk sutures. The surgeon further satisfied himself by securing a tab of omentum over the site of the rupture. The postoperative course was uneventful but because of the history of hemorrhage and the recent perforation the patient was advised to return to the hospital after 30 days for a subtotal gastric resection.

In compliance with the advice of his surgeon the patient returned. Preparation for the operation included a gastrointestinal series which was repeated because of the *bizarre findings*. On each examination from one to three negative shadows were observed in the antrum of the barium-filled stomach. The number of these shadows depended somewhat on the phase of peristalsis. During extreme systole only one shadow could be observed (fig. 1); with less vigorous contraction two (fig. 2); and in diastole three could be seen (fig. 3). In addition the contour of the most persistent shadow changed from a rectangular configuration to a triangular one and finally to one more oval in shape. The radiologist was somewhat bewildered by these changes. To paraphrase an old bromide the stomach appeared to be quicker than the eye.

At the second operation the previously described black silk sutures were all intact and the anterior wall of the antrum presented its plicated appearance. Unfortunately no photograph was made and the sutures were released in order to accomplish the partial gastric resection. On examination of the operative specimen it was found that the ulcer had healed with residual scarring barely perceptible to the naked eye. The gastric mucosa showed no hypertrophy of the rugae and there was no evidence of tumefaction. It was immediately apparent to all that the bizarre radiologic findings were produced by the gastric wall folded into the plication.

### DISCUSSION

Radiologists and surgeons are always keenly interested in negative shadows seen through a viscus containing barium when these shadows are not produced by normal mucosa. The constancy of shadows is a criterion not to be passed over lightly. In this case only one shadow was constantly present and the configuration of this shadow changed under fluoroscopic and spot film observation. Perhaps we should have realized preoperatively that our "tumors" were surgeon made. Actually this was considered but not seriously.

The dynamics of the observed phenomena can be explained if one considers the functions of the muscle layers and the mucosa of the stomach. Golden (2) tells us from his experimental work on dogs that antral systole is associated with a contraction of the longitudinal

(2) Golden, R. Roentgen-Ray Examination of the Digestive Tract. (Reprinted from Vol. 11, Loose-Leaf Diagnostic Roentgenology) Thomas Nelson & Sons, New York, N. Y., 1949, p. 296.

muscle toward the pylorus. He further quote Schindler who from gastroscopic observation describes a shortening of the antrum with peristalsis. The mucosal folds of the antrum which during relaxation run transversely across the stomach shift to the long axis when systole occurs. The muscularis normally is freely movable and shifts cephalad when the longitudinal muscle layer contracts. Redundancy of the mucosa in the antrum is thus prevented during the systolic phase. In our patient it is believed these normal movements were impeded by the sutures and in the case of the most persistent shadow observed at the site of the perforation of the ulcer this fixation of the layers contributed to the formation of a mass of tissue. The multiple shadows seen during the diastolic phase using pressure technic are caused entirely by the plication of the gastric wall causing the mucosa and muscle layers to project or bulge into the lumen. The report of this case may save other radiologists and surgeons from similar confusion.

# A Method of Sterilizing and Maintaining the Dental Handpiece

Jerome B Casey *Commander DC, U S, N* (1)

USUALLY particularly in the Tropics the procedures that suffice to sterilize and maintain dental instruments invite rust excessive wear and excessive vibration, if not actual stoppage of the dental handpiece. Therefore the handpiece should be cleaned and oiled daily and wiped with one of the approved solutions between patients. Running the handpiece in an oil-antiseptic mixture and, as most recently advocated placing it in a small container flooded with ultraviolet light are also recommended.

Efforts simultaneously to clean sterilize and lubricate the handpiece using hot oil in whole or in part in various simple and complicated technics have been advocated by Rehrner Parke and others. The Council on Dental Therapeutics of the American Dental Association stated in Accepted Dental Remedies that experiments in which *Bacillus anthracis* was used as the test organism indicate that immersing the handpiece in light liquid petrolatum at 185° C. for 5 minutes will disinfect it. There is however a fire hazard involved in using the old type of sterilizer intended for use with water only because its heating coils are capable of taking the oil above its flash point. For this reason there was a service directive several years ago that only sterilizers especially designed for oil were to be used with oil.

Because of the great number of water sterilizers on hand, the cut back in military appropriations and more recently impending shortages caused by the Korean war the oil sterilizers have been and are slow in coming and will be almost unobtainable for some time to come. The simplest method of oil sterilization at the chair namely placing the handpiece in the upper right spray bottle container up to the wrist piece and turning the control on full heat with light liquid petrolatum

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(1) Naval Station Roosevelt Roads Puerto Rico.

in the container is an effective way of maintaining the handpiece under tropical condition. This method probably was first used early in World War II in an Army installation in the Tropics.

The company manufacturing the standard operating unit used by the Navy was asked whether the oil would ignite if the rheostat lever of the spray bottle heater were left on 5 (maximal heat) for a prolonged time. It was found that it would be all right to use mineral oil in the spray bottles, because our spray warmer with the control set at 5 only goes up to about 200° F. and stays at about 200° F. without injury to the unit. We checked this and found that the temperature of the oil was consistently below 230° F. in the spray bottle. The usual temperature after the unit had been on for 45 minutes was between 220 and 230° F. When the oil was used in the metal container without an intervening bottle and in space the temperature of the oil rose to between 230 and 240° F. but did not rise higher. In other words, no thermostat was involved and none was needed because the coil did not heat the container above 240° F. (more than 150° F. below the flash point of even light oil).

It was convenient to keep one handpiece at a time in the heater, one on the cabinet and one on the wristpiece, rotating their use so that during full operative appointment one handpiece was cooling and draining as one was being used and the third was being sterilized for at least 10 and usually over 30 minutes. Thus a safe sterilization time is assured without the necessity for prompt removal in order to avoid rusting. Furthermore the long immersion time is effective in cleaning the handpiece without the use of highly volatile substances. Although the oil could be used directly in the metal container, which would allow several handpieces to be placed in the oil at the same time: (1) convenience in emptying and cleaning the receptacle, (2) the fact that the oil would rise higher on the handpiece placed in the intervening bottle, and (3) the pressure factor all prompted the use of a wide-mouthed bottle placed in the metal container.

# A Case of Hemophilia<sup>(1)</sup>

William M. Webb, *Lieutenant Colonel, MC, U. S. A.*

Manuel D. Altamirano, *First Lieutenant, MSC U. S. A.*

THOSE cases of disease which follow the textbook picture present no diagnostic problem as long as they are kept in mind. Often cases which we believe represent a definite diagnosis present certain discrepancies in the findings from a clinical or laboratory standpoint.

Robbins (2) reported a case of hemophilia which in many respects, is similar to ours. In attempting to prove the diagnosis of hemophilia in our patient we could not, by following the procedure outlined by Quick (3), obtain the findings which we believed we should in regards to the prothrombin consumption time. Nevertheless we made the diagnosis of hemophilia and separated the man from the service. On the basis of history alone this man should not have been enlisted.

## CASE REPORT

A 23-year-old soldier was admitted to this hospital on 15 January 1951 for evaluation and ultimate discharge from the service because he was a bleeder. He was rejected by the draft board in May 1945 because of his history but on 9 November 1950 he was enlisted. His father age 62, was living and well with no history of abnormal bleeding. His mother age 62, was living and had arthritis. The patient had two maternal uncles one of whom died at age 26 and one at 31 from uncontrolled bleeding. Both uncles had bled frequently as children. The patient's maternal aunt had four children of whom one was a boy; he was not a bleeder. The patient has two brothers both unmarried who are not bleeders and two sisters. Each of his sisters is married and has one son. Neither nephew is a bleeder.

The patient was told that as a baby whenever he fell and bumped his head, he would have a large swelling in that area. As a child, he was watched very carefully to prevent his cutting or injuring himself.

(1) U. S. Army Hospital Fort Benning, Ga.

(2) Robbins, J. J. Hemophilia, report of case. U. S. Na. M. Bull. 49: 1115-1120 Nov. Dec. 1949.

(3) Quick, A. J. Management of hemophilia: general practice. J. A. M. A. 143: 4-8, Jan. 6, 1951.



When he was about 6 years old, he mashed his right great toe. It was necessary to keep him in bed for about 2 months at this time because the toe was quite swollen and oozed blood continuously for 11 days and nights. At various times there was bleeding into his ankles and right knee following minor trauma. His right knee was swollen for years in childhood and he complained on admission that if he walked much it became enlarged but not painful.

In February 1947 he went to local hospital to have some teeth pulled. Because of his history of abnormal bleeding he was hospitalized while having 10 teeth extracted. He remained in the hospital for 3 months and had 10 transfusions. He entered the hospital weighing 170 pounds and was discharged weighing 98 pounds. This information was substantiated by the local hospital. A letter from his family physician stated that many methods of controlling hemorrhage were used, but he had continued to ooze profusely from his gums. The family physician further stated that they were unable to make a diagnosis of the condition because bleeding and coagulation time were normal. About 1 year prior to admission the patient fell from a horse and bruised his right thigh. The thigh swelled to at least twice its normal size and became discolored. He was bedridden for 2 months at this time.

TABLE 1. *Prothrombin consumption time / normal control and patient compared with standard for diagnosis of hemophilia*

		Time (formation of solid clot (minutes))			
		15	30	45	60
		Prothrombin consumption time (seconds)			
Control	1	22	34	46	40
	2		28	47	
	3			30	
	4				
Patient	1	7	25	27	
	2		7	20	
	3			9	
	4				
Standard (hemophilic)	1	9	9	9	
	2		9		
	3				
	4				

Physical examination revealed a tender 6 by 7 cm in the lower half of the lateral fibrotic mass was freely movable near the firm attached to the underlying muscle. No

The Rumpel Leede's sign was negative. A roentgenogram of the lower half right thigh was negative. The erythrocyte count, leukocyte count and sedimentation rate were normal. The prothrombin time was 16 seconds (equivalent to 90 percent concentration). The platelet count was 340 000. The bleeding time was  $2\frac{1}{2}$  minutes; the clotting time (venous blood slide method) was 18 minutes; the prothrombin consumption time was abnormal and the clot retraction was complete after 4 hours.

The prothrombin consumption time was determined following Quick's method (4) using a normal individual simultaneously as a control (table 1).

### DISCUSSION

In the case presented results were obtained which do not correspond with the findings in a normal person, nor in a hemophilic patient as reported by Quick. At the time the prothrombin consumption time was determined the coagulation time of the patient's venous blood using the slide method, was 18 minutes. The patient's prothrombin consumption time at 15 and 30 minutes after the solid clot formation was 7 seconds whereas, in the normal control it was 22 and 28 seconds. In the serum of normal venous blood sufficient thromboplastin remains to obtain a normal prothrombin time. In contradistinction, in the serum of our patient an excess of thromboplastin remained to produce a rapid prothrombin time. Although the case presented did not show the results that Quick found in his studies, the history and clinical findings were typical of hemophilia, and although the prothrombin consumption time did not confirm the diagnosis (if the criteria established by Quick are adhered to) it was not normal and did lend some support to the diagnosis of hemophilia. It would appear that there was some deficiency of thromboplastin in our patient.

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(4) Quick, A. J. Coagulation mechanism with special reference to interpretation of prothrombin time and consideration of prothrombin consumption time. *Am. J. Clin. Path.* 19: 1016-1023, Nov. 1949.







# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
Agency, Department of Defense*



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THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY  
THE DIRECTOR OF THE BUREAU OF THE BUDGET OCT 19 1949

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON 25, D. C.

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

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*United States Navy*



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OFFICE OF THE SECRETARY OF DEFENSE  
ARMED FORCES MEDICAL POLICY COUNCIL  
WASHINGTON 25

**SUBJECT: Personnel of the Medical Services of the United States  
Armed Forces**

Department of Defense supplies of dried human blood plasma have been gravely depleted by the demands of the Korean campaign. It is imperative that every possible effort be made to assure the continued availability of blood plasma for military purpose and in adequate supply all the rest of the year.

The Department of Defense is continuing its long and continuous and vigorous campaign, in conjunction with the Red Cross, to persuade the civilian and military population to contribute whole blood to the Armed Forces. Full cooperation by all elements of the three services is urged in continuing the civilian population and military personnel of the vital military necessity of supporting this program. An Armed Forces Blood Donor Program has been established within the framework of the campaign, which is to obtain blood from service personnel on military bases within the continental United States. Existing medical facilities and personnel will be used to the greatest possible extent. The Armed Forces blood donor portion of the program will be under the policy guidance of the Armed Forces Medical Policy Council and general direction and control has been assigned to the Directorate of the Armed Service Medical Procurement Agency. All local Armed Forces Blood Donor Programs will be submitted to the Directorate for approval prior to actual collection of blood in order to avoid war.

I know that all military medical personnel will wholeheartedly support and participate in this most vital Blood Donor Program.

*W. Randolph Lovejoy*

W. Randolph Lovejoy, M. B. C.  
Chairman

# UNITED STATES ARMED FORCES MEDICAL JOURNAL

Volume II

September 1951

Number 9

## Field Use of Methadone and Levo-Iso-Methadone in a Combat Zone

(Hambung-Hungnam North Korea)

Henry K. Beecher M. D.

Philip A. Deffer *Captain, MC, U S A.*

Frank E. Fink, *Captain, MC, U S A.*

Daniel B. Sullivan *Captain, MC, U S A.*

IT IS possible that we may be cut off from sources of supply of opium and its derivatives. For this reason extensive studies were undertaken to ensure an adequate supply of pain-relieving agents to take the place of morphine. The goal was to find an agent at least as good as morphine and which can be made from cheap and common chemicals. This objective has met with some success. In this the prolonged support not only of the Medical Research and Development Board of the Office of the Surgeon General of the Army must be mentioned but also the Committee on Narcotics and Drug Addiction of the National Research Council and the National Institutes of Health of the U S Public Health Service.

Thousands of clinical uses of members of the methadone family in controlled studies at the Massachusetts General Hospital (1,5) and elsewhere (6) have made it clear not only in studies of analgesic

(1) Denton, J. E. and Beecher, H. K.: New analgesics: I. Methods in clinical evaluation of new analgesics. *J. A. M. A.* 141: 1053-1057 Dec. 10, 1949.

(2) Denton, J. E. and Beecher, H. K.: New analgesics: II. Clinical appraisal of narcotic power of methadone and its isomers. *J. A. M. A.* 141: 1146-1148, Dec. 17 1949.

(3) Denton, J. E., and Beecher, H. K.: New analgesics: III. Comparison of side effects of morphine, methadone and methadone isomers in man. *J. A. M. A.* 141: 1148-1153 Dec. 17 1949.

(4) Keats, A. S., Beecher, H. K., and Mosteller, F. C.: Measurement of pathological pain in distinction to experimental pain. *J. Appl. Physiol.* 3: 35-44 July 1950.

(5) Keats, A. S. and Beecher, H. K.: A comparative study of the effects on the respiration of methadone, morphine and barbiturates. Unpublished work in progress, 1951.

(6) Troxell, E. B.: Clinical evaluation of analgesic methadone. *J. A. M. A.* 136: 920-923, Apr. 3, 1948.

power but also in studies of side effects that two of the best agent racemic methadone (6-dimethylamino-4,4-diphenyl heptanone-3) and levo-iso-methadone (6-dimethylamino-5-methyl-4,4-diphenyl heptanone-3) were at least as good as morphine and in the latter case better. The agents can be synthesized relatively easily from readily available materials.

Before any sweeping decisions were made as to morphine stockpile it appeared desirable to give these agents a field trial. It is difficult to arise there that were neither encountered nor foreseen in civil life. This report gives an account of such a field trial in two types of installation, forward and rear. An evacuation hospital was the scene of the forward trial. It was at that time situated at Hamhung, North Korea, about 35 miles from the Chosin-Chungjin Reservoir where the Chinese Armies were massed. This hospital was in the most forward position at the time of the trial and received wounded men by air evacuation directly from the place where they fell near the reservoir. The temperature there was 27° F below zero. Some idea of the proximity of this installation to the front can be given by recording that on the first night of the study enemy troops were around the hospital three times. Ambushes were common and men wounded locally were also cared for. The tests in the rear were carried out at the Tokyo Army Hospital.

### PROCEDURES

In the publications from our laboratory previously referred to we have emphasized the importance of appraising the effects of all analgesic drugs without knowledge of their nature at the same time pitting the new agent against a placebo of saline solution on one hand and a standard dose of morphine on the other hand. These standards were maintained in the rearward studies but in the forward work (Hamhung) only one observer was available. Here objectivity was preserved as well as possible by a mechanical rotation of the agents employed whenever pain warranted the use of a narcotic and by a coding any inspection or summation of data until the entire study was completed. The similarity of the data obtained both at Hamhung and at Tokyo with the large civil trial in Boston indicate that objectivity of appraisal was carried out even though the conditions in the forward test were not ideal.

*Patients*—At Hamhung attention was focused chiefly on the freshly wounded, at Tokyo on postoperative patients. Only patients having persistent steady wound pain, severe enough to require a narcotic and not primarily associated with movement, were included in the study. Patients who were uncooperative or who were in a clouded mental state were excluded. Sometimes patients complained of more than one type of pain, for example headache and wound pain, or pain of a different type in two wounds. The narcotic may sometimes relieve one pain but not the other. We adopted arbitrarily the practice of judging

the effectiveness of the narcotic by its success in relieving the pain for which it was given. Pain caused by motion was not used because it is often impossible to relieve it entirely with reasonable doses of a narcotic.

*Observers* —At Hamburg because only one observer was available for the study he made constant rounds of all wards throughout a 16- to 18 hour day appraising patients and giving narcotics according to the criteria mentioned above. A complete circuit required about 40 minutes with interruptions to see patients on the study at 45 and at 90 minutes following medications. At Tokyo three medical officers worked around the clock. Although without previous research experience they were given a brief protocol to follow and 1 hour's indoctrination on the wards. Following this they were left alone for about a 2-week period. The identity of their results with those of observers with long experience supports the usefulness of the Denton and Beecher (13) method for measuring pain relief. This is emphasized by the fact that no equipment other than notebook and pencil is involved.

*Drugs.*—At Hamburg (1) racemic methadone (2) levo-iso-methadone and (3) morphine all in 15 mg individual dose (4) a 1 ml normal saline solution (placebo) (5) a solution containing 5 mg of morphine with 50 mg of pentobarbital sodium, and (6) a solution containing 100 mg pentobarbital sodium were used. Five of these solutions (all except the mixture of barbiturate and morphine) came in individual ampms under gas pressure (so that the drug would be delivered automatically when the stem of the ampin was broken within a rubber tube attached at one end to the ampin and at the other end to a sterile needle). Fifteen milligram doses of the methadones and the morphine (alone) were used, because this is the dose proposed by others for military use. We should prefer to see 10 mg doses used for military purposes. The mixture of barbiturate and morphine was dispensed in the usual manner from a stock bottle. These agents were rotated to the patients in a mechanical way.

At Tokyo racemic methadone levo-iso-methadone and morphine all in 10 mg individual doses and a 1 ml normal saline solution placebo were used. Each was given a code number and they were rotated mechanically without knowledge of what was being used. The 10 mg dose of narcotic was used here because we (7) have found that from 7 to 9 mg give as much analgesic effect as 15 mg—a point too little appreciated in the clinical use of narcotics. This is supported further by the similar data obtained at Hamburg and Tokyo. Although we have shown separately the data obtained in the two places we have not hesitated to combine them in a third table for the reason just stated. In the large civil study the 10 mg doses of narcotic were given per 70 kg of body weight. In order to simplify the military trials we used fixed total doses as indicated because all agents were admin-

(7) See tabl. 6 of reference (2).

istered to previously healthy young men in good physical condition. The differences in size would cancel out for in this instance we were interested only in comparative not absolute data. It is doubtful if there would be any detectable difference here in any case.

*Technic.*—The method of measuring pain relief as developed by Denton and Beecher (1, 3) and Keats et al. (4) involves the use of groups of patients having steady wound pain. At specified intervals in this case 45 and 90 minutes after administration of the drug the patients were questioned as follows: "How do you feel now in comparison with the way you felt before you had the medicine?" "Do you still have your pain? If the answer is Less How much less is it? Is it more or less than half gone? Do you need more medicine for it?" The interview was recorded as positive when the pain was reported as more than half gone. Curiously enough this is a distinction patients usually make easily. Anything less was recorded as negative. In this particular study pain alone was considered; comfort and pain relief were not differentiated here (4) and sleep, loss of anxiety or restlessness were not considered. If the patient was asleep at the time for evaluation drew near he was awakened. The rationale for this is discussed in the papers referred to. Occasionally a patient would insist that his pain was just one-half better, no more, no less. Such a result was discarded and not included in the evaluation. This is statistically sounder than a guess by the observer. We used the arbitrary convention that a positive result was necessary at both the 45- and 90-minute evaluation periods for a satisfactory result. A negative finding at either or both times resulted in a designation of the pain relief as unsatisfactory. The percentage of satisfactory doses of the total was the index used for comparing the several agents.

If, for some reason, any early evacuation of the patient, the 90-minute appraisal was not possible the subject was dropped from the tally. If at the 45-minute interview the pain was even worse than before any medication was given, re-medication was permitted and the patient dropped from the study. (The pain state was not steady.) An attempt was made to await the return of the original complaints before the next drug was administered.

## RESULTS

The data obtained are shown in tables 1, 2, and 3. A test of the assumption of equality of the percent obtaining true relief from racemic methadone, levo-iso-methadone, and morphine in the doses used at Hamburg and Tokyo shows no evidence of differences. Now pooling the results of the three narcotics from table 3 and comparing them with the combined outcome for the placebo gives a difference well beyond the 0.01 level of significance. These results are in excellent agreement with those obtained in the work at the Massachusetts General Hospital. There is no significant deviation in the combined Tokyo and Hamburg data from percents observed in the large civil trial of the agents. In

TABLE 1.—*Hamburg data—54 medications in 43 patients*

## Agent used and dose

Result	15 mg. of racemic methadone	15 mg. of levo-iso-methadone	15 mg. of morphine	Placebo	5 mg. of morphine with 50 mg. of pentobarbital	100 mg. of pentobarbital
Sati factory_____	9	9	7	2	9	4
Unsatisfactory ____	0	1	2	7	0	4
Percent relief ____	100	90	78	22	100	50
Percent relief in large civil trial	80	80	80	20	—	50

In the civil trial 10 mg. per 70 kg. of body weight was the dose used for morphine and the two methadones.

TABLE 2.—*Tokyo Army Hospital—78 medications in 46 patients*

## Agent used and dose

Result	10 mg. of racemic methadone	10 mg. of levo-iso-methadone	10 mg. of morphine	Placebo
Satisfactory _____	17	14	15	7
Unsatisfactory ____	3	5	4	13
Percent relief _____	85	74	79	35
Percent relief in large civil trial ____	80	80	80	20

TABLE 3.—*Combination of Tokyo and Hamburg data*

## Agent used

Result	Racemic methadone	Levo-iso-methadone	Morphine	Placebo
Sati factory _____	26	23	22	9
Unsatisfactory ____	3	6	6	20
Percent relief ____	90	79	79	31



all cases the statistical testing was done on binomial probability paper as described by Mosteller and Tukey (8).

### DISCUSSION

It is clear whether one looks at the Hamburg sample or at the larger body of Tokyo data, at the combined material or at the information obtained in a civilian population, that either of the two methadones is as effective as morphine in pain relief. From the work at the Massachusetts General Hospital we know that milligram for milligram the racemic methadone is also the equivalent of morphine in side effects. It is too soon to say how the addiction liabilities will compare. This equivalence of side effects with morphine for the racemic methadone needs to be emphasized, for too many loose statements are made that the methadone is a great clinical improvement over morphine. There is no dependable evidence that this is so. It seems to be exactly as good, not better.

The statement is also made rather frequently that racemic methadone has less hypnotic effect than morphine. We (13) could find no statistical support for this in man in the most carefully controlled experiments we could devise. In this we considered 7 parameters in 29 normal men: sleep, drowsiness, pleasant affect, relaxation, fatigue, objective ataxia, and subjective ataxia. Had there been dependable differences in hypnotic effect between morphine and the racemic methadone these differences should have been reflected in small probabilities in our significance tests. However the probabilities observed were large averaging about 0.5 with none less than 0.19. We are obliged to conclude that the common statement that methadone has less hypnotic effect than morphine milligram for milligram, is not correct.

Demon and Beecher (13) showed, and in work in progress Keats and Beecher have confirmed, that there is demonstrably less nausea and vomiting in normal ambulatory men following the use of the levo-isomer-methadone than after either morphine or racemic methadone. The racemic methadone is, however, valuable because (1) it is as good as morphine (but not better) and can be made relatively easily from readily available chemicals and (2) it can be substituted for morphine in addiction and the morphine addiction sustained as Isbell and his associates at the U. S. Public Health Hospital at Lexington have shown, with few or no withdrawal symptoms. The methadone can then be withdrawn promptly with the appearance of only mild abstinence phenomena.

Table 1 indicates that 5 mg. of morphine with 50 mg. of pentobarbital sodium is as effective as 15 mg. of morphine. This agrees with our

(8) Mosteller, F. and Tukey, J. W. Uses and abuses of binomial probability paper. *Journal American Statistical Association* 44: 174-212, June 1949. We wish to acknowledge with thank Professor Mosteller's personal guidance in this statistical testing.

other clinical findings (9-11). In table 2 the only real difference between the civil experience and the Tokyo data is in the effectiveness of the placebo in the two studies. It is not surprising that we obtained a somewhat higher percentage of relief from the saline placebo in the Tokyo Army Hospital than at Hamburg and in our civil experience. As we have pointed out in a previous report (12), the wounded soldier passes from his first state of euphoria to a depressed anxious state. This is often found at the military general hospital level. At this level the attention inherent in the injection procedure is of more importance than it is to the freshly wounded man. This perhaps is reflected in the higher percent of pain relief from the placebo. If these new agents are to be used in the Civil Defense program, it is our belief that they as well as morphine should be put up in 8-mg dose size whether in ampules, ampins or syrettes. Many of these will be used in children, in cachectic adults or in persons debilitated by wounds. It is easier to give two doses than it is to slow down the absorption of an already injected dose that proves toxic.

### CONCLUSIONS

Racemic methadone, levo-iso-methadone, a solution containing small doses of both morphine and a barbiturate and pentobarbital sodium have been studied in a combat zone under rugged conditions. These agents have been compared with morphine and with a placebo (normal saline solution). This work with the methadones confirms our work in a civil hospital as to their analgesic effectiveness. Both the racemic and the levo-iso-methadone have exactly milligram for milligram the same power to relieve pain that morphine has. Experience with the barbiturate and with the combination of small doses of a barbiturate and morphine was found to be like that previously observed.

This work provided an opportunity to test the adaptability of our method for measuring pain relief (where the only physical equipment necessary is a notebook and pencil) to conditions of the field and to use by observers not previously experienced in research yet they obtained the same percentage of pain relief with these agents as experienced observers. Emphasis is given to the fact that from 7 to 9 mg of morphine will give as much pain relief as 15 mg although the undesirable side effects are greatly increased in the latter case. Racemic methadone and levo-iso-methadone are neither better nor worse than

(9) Beecher H. K.: Symposium on management of Coconut Grove burns at Massachusetts General Hospital; resuscitation and sedation of patients with burns which include the airway some problems of immediate therapy. *Ann. Surg.* 117: 825-833, June 1943.

(10) Beecher H. K.: Pain in men wounded in battle. *Ann. Surg.* 123: 96-105, Jan. 1946, also *Bull. U. S. Army M. Dept.* 5: 445-454, Apr. 1946.

(11) Beecher H. K.: Resuscitation and Anesthesia for Wounded Men, the Management of Trauma or Shock. *Chas. C. Thomas, Springfield, Ill.*, 1949, p. 94.

(12) Beecher H. K.: Preparation of hard casualties for surgery. *Ann. Surg.* 121: 765-792, June 1945, also, *M. Bull. Mediterranean Theat. Op.* 3: 225-236, June 1945. (See particularly p. 771.)

morphine in pain-relieving power. It is significant, however, that less nausea and vomiting are associated with the levo-iso-methadone than with the racemic methadone.

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**ACKNOWLEDGMENT** This study was made possible through the cooperation of the U. S. Army. It was arranged by the Medical Research and Development Board, Office of the Surgeon General.

# Thoracic Injuries in World War II

## II Therapy in the Reconstructive Phase (1)

Joseph P. O'Connor *Commander MC, U. S. N. R.* (2)

ALL 309 patients with war wounds of the chest wall and lungs included in this study were received at a hospital on the mainland 2 months or more after the injuries were sustained. These patients had been divided into 3 classes for the consideration of definitive care. In class 1 were placed those requiring only simple or no treatment on arrival; in class 2, which included the largest number, were those requiring definitive treatment on admission; and in class 3 were those placed in a category for elective treatment.

The circumstances under which these casualties resulted varied. Likewise the immediate first-aid treatment they received was not the same or organized and for the most part not ideal. Some of these patients received excellent first aid and treatment in the acute phase but owing to the long distances which had to be covered from the beach, atoll, island or aboard combat ship to fleet and base hospitals and the time consumed from the latter via hospital ship and transport to large thoracic centers in mainland hospitals the clinical course of the condition of these injured men was forgotten or overlooked along the way in some instances. Much credit is due to the physicians who first attended these men for it could be seen that they were handled competently. These medical officers were in no way responsible for the changes or complications which would occur as the result of the injured being transferred from one medical activity to another. This study therefore is not confronted with such problems as shock, sucking wounds, pain in the chest wall or mechanical problems of breathing.

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(1) Part I, General Considerations, Alterations of Pulmonary Physiology and Therapy in the Initial and Reparative Stages, by Howard K. Gray, Captain, MC, U. S. N. R., and James D. Fryfogel, M. D., appeared in the August issue of this Journal; and Part III, The Surgical Treatment of Traumatic Lesions of the Intrathoracic Cardiovascular Structures, by Herbert D. Adams, Commander, MC, U. S. N. R., will appear in the October issue.

(2) Pasadena, Calif.

## GENERAL CONSIDERATIONS

The types of thoracic surgical problems encountered when drafts of casualties were received included hemothorax, hemopneumothorax, simple effusion, empyema, fore gun bodies in the chest wall and lung and mediastinum, bronchopleural fistula, fibrothorax, diaphragmatic hernia, arteriovenous aneurysm, injuries to the brachial plexus, sinus of the chest wall, and pneumothorax. Several of these wounded had a combination of thoracic and abdominal injuries and had associated orthopedic, plastic and neurosurgical problems. A distinction between open penetrating and nonpenetrating injuries is not made except to mention that in a few patients hemothorax and even fracture of the ribs were sustained after exposure to blast.

Thought must be given to the benefit practically all these men received from the use of the sulfonamides in the early part of the Pacific conflict and later from the combined use of sulfonamides and penicillin. There can be no doubt but that these two agents used in conjunction with therapy for shock were valuable prophylactic weapons and prevented complications and sequelae, not to mention saving lives. Previous generous use of these agents may have misled many medical officers en route who would only see the patient for a short time. The clinical course was falsely masked and the patient's condition considered as satisfactory whereas sometimes a large hemothorax, sterile abscess or even empyema was allowed to exist unnoticed.

## PRELIMINARY EXAMINATIONS

All of the patients included in this study were examined roentgenographically and fluoroscopically when first seen. Posteroanterior, lateral and oblique views and lordotic lateral decubitus and heavy Bucky penetration roentgenograms were made when indicated. Because weeks had elapsed between the date of injury and the date of admission to our service, few patients showed almost complete clearing of previously treated hemothorax, pneumothorax and pneumonia induced by "concussion" injuries. Some of these patients had practically normal-appearing chests and clear pulmonary fields on our first examination. Many of the patients with class I lesions and with normal parenchymal findings showed single or multiple fractures of the ribs, some with only spray of metallic fragments. Very few instances of infection of the ribs were noted and this may have been due to the administration of sulfonamides and penicillin.

## CLASS I PATIENTS

These patients required little of our attention. Their treatment was almost completed in the acute phase of their injuries when the principles of the treatment of shock, the arrest of hemorrhage, the correction of disturbed cardiorespiratory function, and the prevention of infection were inaugurated. Many were evacuated because of a small hemothorax or effusion which had cleared up en route. Others had be-

variously treated by transfusion, suture of a sucking wound and removal of a foreign body at forward bases. A few had small effusions which appeared to be subsiding and were retained on the ward until clearing occurred. Several had moist granulations that filled old chest wall sinuses which soon healed. Forty-nine of this class had sustained through-and-through bullet or shell fragment wounds associated with hemothorax. On admission to our hospital the pulmonary fields were practically normal and roentgenograms showed little evidence of the previously described hemothorax as recorded in the health records of these patients. Several combined abdominothoracic wounds involving the liver diaphragm, spleen stomach colon and lung were repaired aboard ship immediately after injury and were no problem on arrival at our hospital.

### CLASS 2 PATIENTS

Although definitive treatment has for its aim the use of various surgical procedures to restore normal anatomy and functions of the thoracic structures most of the problems on our service originated from the various sequelae of hemothorax.

*Hemothorax* —Practically all wounds of the chest, penetrating and nonpenetrating are associated with hemothorax of varying degree. This collapses and compresses the lung and in time the blood becomes clotted. In the interim an excellent culture medium for bacterial growth is afforded. Replacing air after aspiration is unnecessary and only invites unwarranted complications. The air maintains collapse of the apex and, should infection intervene the empyema may become very large or even total instead of small and limited at the base when the upper pulmonary field is allowed to re-expand and become adherent to the chest wall. Most wounds which penetrate the pleural cavity and even those causing parenchymal damage allow admission of air to set up the clotting mechanism even before the hemothorax becomes advanced and therefore added air only enhances clotting.

Of the 309 patients 276 (89 percent) had hemothorax either on evacuation or on arrival at our hospital. To begin with, in all instances patients with hemothorax were immediately aspirated with a 15 or 16-gage needle and the procedure was repeated at least every 36 hours. We were able to clear up the condition by aspiration alone and without surgical intervention in 121 (39 percent) of the entire series. Several of these patients were aspirated only once and 30 cc. was the smallest amount of fluid obtained. Penicillin was always instilled after aspiration. Many of the 121 patients underwent thoracentesis repeatedly because the pleural cavity was small, the clotted material interfered with aspiration only to a minor degree and although the finally dried out pleura remained thick, the benefit to be gained by thoracotomy would not have been enough to warrant surgical risk. In many instances the hemothorax was called "effusion" because the fluid obtained approached the typical straw color. Most class 2 patients were returned

to duty. In this group of 121 patients the number who never previously had undergone aspiration and the number who had undergone aspiration prior to admission to the sick list at our hospital were about equal. Just why in such a large number of patients the hemothorax should clear up without the complications of clotting and serious infection cannot be explained. We first noticed that the injuries of a few of the men who had through-and-through bullet wounds cleared up after only a minor hemothorax. It was thought that bullets passing through the body at high speed caused no injury to intercostal vessels and only a minimal insult to the parenchyma of the lung. Later patients with identical injuries first came to us with almost total empyema so this theory was abandoned.

*Technic.*—The same technic for aspiration and local anesthesia was used in every case. Roentgenograms in the various views and Bucky exposures were studied. As a rule a site in the midaxillary line was chosen without any attempt to place the needle in the most dependent interspace. When fluid was difficult to obtain, change to a 2 or 5-cc syringe often brought success. The original specimen was used for bacterial study and if it was found to be infected examination for penicillin-resistant and penicillin-sensitive organisms completed the initial routine. Much diligent work was attempted to rid the pleural cavity of the fluid debris, and clots. Sodium citrate, physiologic saline, azochloramid and tyrothricin solutions were used in pleural lavage depending on the nature of the aspirated material, and in many patients a long-standing hemothorax was evacuated and the lungs were re-expanded. This same procedure was followed even in the patients with a slight empyema where large amounts of penicillin were instilled after the lavage. Empyema in 18 of 68 patients was thus cleared up without resort to surgical measures.

This differential treatment of late or old thoracic injuries does not differ from the handling of hemothorax in the acute phase because the treatment of choice is rapid re-expansion of the lung; this can be accomplished only by repeated aspiration which is done without replacement of air. Early in the war such statement seemed to be rather dogmatic because the old teaching, especially that used in prewar civilian practice was to regard hemothorax in a conservative manner hoping that the blood would absorb by itself.

Our statistics compare favorably with those of other in regard to the status of the patients with hemothorax at the time they reached us when considered from the standpoint of whether or not they had undergone aspiration previously. One writer found that 17 percent of 200 patients who had undergone aspiration prior to admission to the base hospital had experienced the development of empyema while 46 percent of 4 who had never undergone aspiration were found to have empyema. Our figures show that in 13 percent of 200 patients empyema developed even though aspiration was carried out prior to admission, while 1

54 percent of 80 cases of hemothorax in which aspiration had not been previously performed empyema followed

*Chronic hemothorax and decortication.*—In our patients with chronic clotted hemothorax the fluid obtained by aspiration had a prune-juice color and was small in amount even though physical and roentgenologic examination of the chest indicated flatness and a massive opaque density. Many of these lesions were not infected as determined by smear and culture. After many attempts at aspiration enough fluid was removed so that the roentgenogram showed multilocular pockets with many fluid levels. A major thoracotomy was performed widely opening the pleural cavity to remove the fibrin and fibrous pockets



Figure 1 — (a) Massive chronic hemothorax requiring decortication. (b) Postoperative results showing retained foreign body

that contained the prune-juice-colored fluid and also yellow custard like clumps of old clotted blood. This was followed in 9 patients by decortication of a tough, rigid, thick, fibrous layer which was deposited on the parietal and visceral pleura to imprison and keep the lung compressed in a corsetlike vise (fig 1)

For decortication the thorax was opened widely with a curvilinear incision in the same manner as would be used for exploratory thoracotomy for pulmonary resection, intratracheal anesthesia was used. All fluid and the custardlike clotted material were scooped up and wiped out. Dissection of the organized fibrous peel on the lung was then carried out. Closed suction with a Stedman pump or underwater seal if the area of decortication was small was always carried out postoperatively.

Fluid and pus developed in 4 of these patients but cleared up with aspiration and without further surgical treatment. One other patient with a sterile "chronic clotted hemothorax" in whom decortication



was performed developed empyema in spite of closed suction drainage and further surgical intervention was necessary. In 3 patients so-called infected chronic hemothorax likewise became complicated by empyema and required rib resection. Two of the 4 decortications which were failure were performed 12 and 14 weeks after injury respectively and when the thick peel was dissected serum and blood oozed from the thin visceral pleura of the lung. It seemed that the peel formed tight symphysis with the lung with fibrous adhesive bands extending down through the visceral pleura and even into pulmonary tissue. None of the patients with hemothorax reached our service less than 6 weeks after injury; most came after longer duration. Usually aspiration was tried first for an average period of 2 weeks. This made the scheduling of decortication from 8 weeks upward after injury which was not ideal from the standpoint of time. The dissections were prolonged and tedious. Although we were enthusiastic about this procedure which eliminated a deforming thoracoplasty the time elapsed following injury explains the relatively few decortications which our service performed in comparison with the experience of others.

Empyema was the greatest problem in 68 of the 309 patients. In many of the class 2 patients empyema developed soon after injury; they had been variously treated by closed intercostal drainage with a catheter flap operations open thoracotomy and some by multiple thoracenteses with further injection of penicillin prior to admission to our hospital. The incidence of empyema was 22 percent.

Hemothorax or thoracic injury may result in the development of empyema no matter how ideal and diligent the treatment. In some patients the empyema was caused by poorly treated hemothorax improperly timed open or closed drainage sucking wounds which sloughed after repair the presence of persistent bronchopleural fistulas, or from foreign body reaction. Just as we were amazed to learn from the health records of some of those injured that a large hemothorax cleared up without ever being aspirated likewise we had difficulty in understanding the fact that purulent fluid appeared a week or two after injury in some patients. What is behind bullets and shell fragments were carried into these injured chests can only be left to the imagination. Chemotherapy and penicillin helped in cutting down sequelae and morbidity. On the other hand these agents rendered a false clinical impression while an unattended hemothorax was being transformed into tenacious pus and was in need of drainage.

Classic methods of drainage were effectual in 29 of the total number of patients with empyema. In none of these did the residual cavity have a capacity of more than 150 cc. All operations were performed in one stage and while a long thoracotomy incision was made resection of only 1 to 3 ribs were removed. Convalescence lasted from 2 to 10 weeks. In none of these patients was there any remaining thoracic deformity. The same is true of the previously mentioned 18 pa-

tients with empyema in whom the condition was cleared up by aspiration and instillation of penicillin.

Twelve patients had thoracoplasty in stages and 9 had one-stage procedures in which ribs and the thick pleural roof of the empyema cavity were removed and muscle transplants were used to fill in the defect. Of these 21 patients 12 had varying visible thoracic deformity. In one patient a lung abscess complicating a hemothorax which followed pneumonitis and atelectasis necessitated a lobectomy.

### CLASS 3 PATIENTS

Class 3 patients consisted of those for whom surgical treatment was elective. For the most part the operation consisted of removal of foreign bodies in the chest wall and the pulmonary parenchyma. In addition, 3 foreign bodies were removed from the diaphragm and 2 from the mediastinum, 3 diaphragmatic hernias were repaired, and 3 arteriovenous or false aneurysms were treated. All class 3 patients were given 2 to 4 months after the date of injury before surgical treatment was undertaken in order that the patient might recover and gain weight and strength and that all possibilities of intrathoracic infection and pleural reaction might be eliminated.

One of the false aneurysms resulted in the only fatality in the 309 patients. This man had been returned to duty overseas after receiving a through-and-through bullet wound of the right upper part of the thorax which healed quickly and without hemothorax. Later he was readmitted to the sick list because of hemoptysis. On the patient's admission to our hospital the roentgenograms revealed a shadow in the extreme apex of the right lung. While allowing his general condition to improve he experienced an almost fatal hemoptysis. Large amounts of blood were given by transfusion and in an emergency operation a large aneurysmal sac connecting the subclavian artery with the apex of the right lung was found and the lung was repaired. The fibrous sac was being closed to be removed later when the man died on the operating table.

*Foreign bodies*—Removal of metallic foreign bodies from the lung did not present much of a problem. For the surgical approach much the same technic as for pulmonary resection was used. Postoperative closed underwater or suction drainage was used followed by early ambulation.

Bullets and large shell fragments in the lung were removed after consideration of the size, proximity to important structures (fig. 2), and the likelihood of future inflammatory and abscess reaction. The minimal size for removal was set at 1 by 2 cm. Many of the patients in this study had metal fragments the size of a pinhead, and the size ranged up to 5 by 10 by 15 mm. Three patients had a regular salt-and-pepper effect and the possibility of pulmonary resection was considered because of the extremely large number of tiny fragments. Finally they were discharged from the sick list without surgical intervention after a rather long period of observation.



Figure 2.—A foreign body lies close to vital structures. (a) Posteroanterior view. (b) Lateral view. The size and location of the retained foreign body make removal mandatory.

**Tissue response.**—It was surprising to note the small amount of reaction around so many of the retained foreign bodies a just a few months following the injury. The missile tracts, for the most part, healed early and the hemothorax and effusion usually cleared up. This course was characterized by clinical improvement and by progressive healing of the lesions as determined by successive roentgenologic examinations. It is always easy to imagine that a metallic foreign body could carry clothing or other debris with it through the thorax and into the lung and be the source of future infection. One large 2 by 2.5 cm. shell fragment removed from the lung was well encased in fibrous tissue but on examination of the removed specimen, threads of cloth were easily demonstrated on the metal. Another 1 by 1 cm. fragment shattered a lead pencil while passing through a pocket of the injured man. The fragment continued on into the lung and caused no reaction, while later the tract, which contained bits of lead and wood from the pencil, broke down and began to suppurate. The tract was excised but the fragment was not removed. Another fragment removed from an intercostal space contained a small amount of serous fluid in the fibrous capsule surrounding the metal. Much damage was produced by another fragment in a man who was admitted with extensive empyema which responded well to aspiration and treatment with penicillin. Re-expansion of the lung caused movement of the foreign body and it ultimately coughed through the visceral pleura and dropped into the small remaining empyema cavity producing a large broncho-pleural fistula. Immediate rib resection was necessary and much surgical treatment was later required to eliminate the fistula.

*Localization technic*—Exact preoperative localization of large fragments was most important. The method employed by our roentgenologist was simple and accurate. By fluoroscopic examination the position of the fragments was marked on the skin with a pencil. Metallic markers A and P\* were placed on the skin of the anterior and posterior chest walls near the fragment site and stereograms of the chest made (fig 3). A true lateral roentgenogram of the chest also was made. The stereogram established the position of the foreign body in relation to the rib cage and the lateral view determined its position in relation to the anterior and posterior chest walls. This technic was supplemented later following a suggestion by several authors by taking a roentgenogram in the lateral decubitus position, duplicating the position of the patient on the operating table.



Figure 3—A foreign body is visible in the lower part of the right lung field, with anteroposterior markers in place for localizing the fragment.

## POSTOPERATIVE REGIMEN

The usual postoperative procedure necessary for patients with thoracic injury were followed for the first 24 to 36 hours after which early ambulation was encouraged and exercises were started. Even patients too obviously ill to be out of bed for weeks were put through organized exercises supervised by the athletic instructor of the physical education and rehabilitation department together with the technicians of the physiotherapy section. As soon as the patient could sit up in bed and subsequently became ambulatory his exercises were increased to the point of tolerance under instruction.

### MUSCLE ATROPHY

A common finding in all cases of hemothorax and in other wounds of the thorax was atrophy of the pectoral and other muscles of the rib cage. In some the atrophy was striking, the patient presenting on admission a visible deformity in just a few weeks after injury. Therefore an important part of the immediate treatment became the exercises. The instructors and technicians stepped up the tempo of the physical activity as the clinical condition permitted to the extent that such strenuous games as volleyball, basketball and tennis became part of the treatment.

### EXERCISE PROGRAM

Many a young, frightened and ill patient was admitted with a large hemothorax and one-half of his chest immobilized and apparently "stuck-in" only to undergo thoracentesis once or twice and begin immediately with a regimen of exercises and suddenly change into a robust lad on the road to recovery. The reason for this is just as obscure as that for the cases of total hemothorax which cleared without aspiration.

### FOLLOW UP DIFFICULTY

In an early report we mentioned that a certain large percentage of the injured were returned to full duty and a certain number to limited duty. Now we believe that such a statement is unreliable because it was impossible to follow the condition of every patient released to duty from our ward. A few returned to us with rather indefinite complaints which were more psychosomatic than organic. Others most likely returned to the sick list elsewhere and still others may have been re-hospitalized even after discharge from military service. The knowledge that they had retained foreign bodies or were told that they had a residual thickened pleural or the fact that they were instructed to guard against infection of the upper respiratory tract or the fact that they had had a thoracotomy and hence had a weak chest may be some of the reasons why the end results will be difficult to establish and why it will be difficult to know whether our work effected a cure or not.

## CONCLUSIONS

Three hundred and nine patients requiring late and definitive treatment because of traumatic lesions of the chest wall and lungs were divided into three classes. Class 1 consisted of those requiring little or no treatment after admission to our hospitals; class 2, those in need of definitive treatment on admission, and class 3—those admitted for elective treatment.

Most class 2 patients presented problems originating from the various sequelae of hemothorax. We are adamant in the statement that in all patients with hemothorax in military or civil life aspiration should be carried out early, often, and diligently and without air replacement. The purpose is to gain as rapid re-expansion of the lung as possible to be followed by early ambulation and a regimen of graded exercises to eliminate the marked atrophy of the hemothorax. This reduces the incidence of chronic clotted hemothorax, empyema, atelectasis, resulting in pulmonary suppuration, altered pulmonary function, and permanent disability of body deformity.

When the hemothorax can no longer be aspirated because of deposition of the products of clot and other debris in the visceral pleura, a large open thoracotomy should be performed to evacuate all this material which has the appearance of custard. If the lung is imprisoned and cannot fully re-expand, decortication should be performed. In some patients with hemothorax, sequelae will develop in spite of the most expert care.

Decortication is a procedure which merits our enthusiasm both for patients with infected hemothorax and for those with noninfected hemothorax, and ideally this operation should be performed no later than 6 weeks after injury. After this time the incidence of postoperative oozing caused by organized adhesions, accumulation of pleural fluid, and decrease in the normal elasticity of the lung is increased.

In empyema the simplest and quickest approach to re-expansion of the lung and elimination of the infected space should be tried. This may run the gamut from aspiration with instillation of penicillin to adequate drainage by means of thoracotomy and decortication on to a deforming thoracoplasty.

Foreign bodies 1 by 2 cm. or greater should, as a rule, be removed as elective procedures. Proximity to important structures such as the contents of the mediastinum, may necessitate removal of smaller fragments. Traumatic diaphragmatic hernias can be repaired as an elective procedure although as a rule this has been done in the acute phase of the injury in combination with repair of abdominal wounds. The sulfonamides and penicillin proved to be invaluable adjuncts.

## Reintroduction of Malaria Into the United States

**S**IGNIFICANT numbers of Armed Forces personnel from Korea are experiencing attacks of vivax malaria after their return to this country. Presumably these infections were acquired last fall though in some instances it is probable that symptoms were not manifested until spring because of prolonged incubation or the effects of suppressive medication. Medical officers should suspect malaria among patients presenting suggestive signs and symptoms and who have been in Korea during the last year. Definitive diagnosis should be based on the demonstration of plasmodia in the blood. The chances of discovering parasites are much better in thick blood films than in thin ones.

Treatment with chloroquine, pentamidine, chlorguanide and other antimalarial drugs will alleviate symptoms promptly. Some patients receiving complete courses of these drugs will remain free from malaria but it is probable that others will relapse after weeks or months. Patients should be told of this possibility and advised to seek medical treatment again if symptoms recur. The likelihood of clinical reactivation becomes less with the passage of time. Relapses are rare after the second or third attack.

Residual insecticides should be applied to sleeping quarters within a mile of parasite-positive persons if the malarial vectors *Anopheles quadrimaculatus* or *A. freeborni* are known or found to be prevalent in the area. If competent diagnosis, adequate treatment, prompt reporting and preventive insecticiding are achieved, it is believed that the present freedom of this country from endemic malaria will be maintained.

# Saline Solution in the Treatment of Injuries With Shock<sup>(1)</sup>

D W Richards Jr M D

## SALINE SOLUTION FOR PARENTERAL ADMINISTRATION

THE proper place of intravenous saline solution in the treatment of injured persons in shock can be adequately defined on the basis of existing knowledge. A large amount of work has been done on this problem over many years, experimentally clinically and in battle casualties during World War II. Although certain questions remain unanswered and some differences of opinion persist, a general statement can be made to which most authorities if not all will agree. This will permit appropriate action to be taken by the Armed Forces and civilian defense agencies for procuring and stockpiling these solutions.

The function of saline solution as an element in the bodily economy is essentially kinetic and not static. Saline solution tends to move through the body rather than remain in it. Normally a salt solution, after intravenous administration, is rapidly distributed throughout the body fluids and then rapidly excreted through the kidneys.

In the presence of dehydration, blood loss and other conditions in which there is a net loss of tissue fluid, additional salt and water is needed for replacement over and above that required for urinary excretion. The same applies to conditions in which extra fluid accumulates in tissues, as in the edema of burns, crush injury and infection. Sweating also uses up electrolytes and water. When these volumes are satisfied, again the basic need for added salt and water is for purposes of urinary excretion.

In acute shock, when blood or plasma is not available, saline solution rapidly administered intravenously can frequently restore and sustain the circulation for brief periods. After 1 or 2 liters of intravenous saline solution, a significant increase in plasma volume will

(1) Prepared for the Subcommittee on Shock of the National Research Council.



(c) Mild to moderate burns. If parenteral fluids are not available saline solution, preferably chilled, can be taken by mouth in amounts up to 2 to 3 liters daily provided patient's general condition is fairly good and there is no risk of aspirating vomitus. Patients sometimes vomit oral saline solution at first, but subsequently are able to retain it.

## 2. Contraindications.

- (a) Severe shock or poor clinical condition with risk of vomiting and aspiration.
- (b) Abdominal injuries.
- (c) Inability to retain oral fluids.
- (d) Renal shutdown not due to dehydration or existing shock.

# Effect of Rapid and Prolonged Rewarming on Local Cold Injury<sup>(1)</sup>

Josef Pichotka M. D.

Robert B. Lewis *Lieutenant Colonel, U. S. A. F (MC)*

THE RATE of rewarming a frozen limb has a decisive influence on the clinical result. The general belief is that slow rewarming is most beneficial and that direct application of heat to a frozen area is injurious and should therefore be avoided (2-3). This assumption is based on popular observations that with slow rewarming alarming clinical signs and symptoms such as marked swelling and severe pain can best be avoided. These observations however are uncontrolled and many of the examples quoted (4) to indicate the danger of rapid rewarming are open to doubt. In recent years several articles showing that rapid rewarming of frozen parts was not harmful but even beneficial have been published (5-9). The most important among these are those of Fuhrman and Crismón (6) and of Finerman and Shumacker (9).

(1) United States Air Force School of Aviation Medicine, Randolph Air Force Base, Tex.

(2) Greene R.: Frostbite and kindred ills. *Lancet* 2: 689-693 Dec. 6, 1941.

(3) Greene R.: Immediate vascular changes in true frostbite. *J. Path. & Bact.* 55: 259-267 July 1943.

(4) Sonnenburg, E., and Tackmarke P.: Die Verbrennungen und die Erfrierungen. *Neue Deutsch. Chir.* 17: 1-131, 1915.

(5) Arev T. Y.: New data on pathology and clinical aspects of frost-bite. *Soviet. vrach. zhur.* 43: 391-402, Apr. 15, 1939.

(6) Fuhrman, F. A., and Crismón, J. M.: Studies on gangrene following cold injury; treatment of cold injury by means of immediate rapid warming. *J. Clin. Investigation* 26: 476-483, May 1947.

(7) Harkins, H. N., and Harmon, P. H.: Thermal injury as effects of freezing. *J. Clin. Investigation* 16: 213-221, Mar. 1937.

(8) Lempek R. E., and Shumacker, H. B., Jr.: Studies in experimental frostbite; evaluation of several methods for early treatment. *Yal. J. Biol. & Med.* 21: 321-334, Mar. 1949.

(9) Finerman, J. C., and Shumacker H. B., Jr.: Studies in experimental frostbite; further evaluation of early treatment. *Surg., Gynec. & Obst.* 90: 430-438, Apr. 1950.

These authors showed that rapid rethawing of tissue lost after a standard cold injury was formed in order to repeat the procedure of cold injury which permitted more results. It was hoped, at the same time, that which would result in more clear rethawing on frostbite tissue.

## MATERIALS AND METHODS

The experiments were performed on albino mice more than 2,500 grams body weight to three different degrees of local cold injury. It had been established in a large number of experiments that 310 animals, cleanly shaved and covered with a condom, was immersed for 30 minutes in water at 10° or 15° C., respectively as described previously. After exposure part of the animals were left in the frozen leg in air at room temperature. Rapid rethawing was performed with 168 animals by immersing the frozen leg in warm water (about 39° C.) until thawing was complete. Some animals were kept in constant motion. Some animals were kept in the warm bath but thereafter no reaction by the animal was observed.

Legs exposed to 10° and 12° C. for 30 minutes were generally rethawed for 5 minutes. At the end of this period most legs were completely thawed; some still displayed denser areas in the upper calf. After exposure to 15° C. for 30 minutes rethawing for 5 minutes often left large parts unthawed. Rewarming was continued in these cases until the solid areas were on the verge of disappearing. This usually required 2 or 3 additional minutes.

For the purpose of the experiments 4 groups of 12 animals each were used immediately thereafter respectively. In each group, 6 animals were exposed to 10° C. for 30 minutes and 6 to 15° C. for 30 minutes.

Rewarming was accomplished in the same manner. The temperature of the animals was left at spontaneous room temperature as control. The animals received the same treatment. The

animals definitely demonstrated the effects of the rethawing. Our experiments were performed by the same method of quantitative measurement. The results of the rethawing might be gained from the rethawing effect on the rapid

(X) Pacheco, J. Lewis, R. B. and others. *Tex. Rep. Biol. & Med.* (in press).  
(XI) Pacheco, J. (Randolph Field, Tex.), *et al.* experimental frostbite. *Proc. Soc. E.*

hydrochloride ointment and a sterile dressing applied (12). This dressing was changed daily until the fate of the leg was apparent. The animals were kept at a constant room temperature of 25° C. and received a standard diet (purina). Most of the animals were sacrificed and examined on the seventh or eighth day after exposure but some were kept for several weeks in order to study secondary changes. Four animals had both hind legs simultaneously exposed to cold for 30 minutes and one leg rapidly rewarmed in water at 42° C. for 5 minutes. The other leg was left to spontaneous rewarming in air at room temperature. For 2 of these the exposure temperature was 12° C. and for the others 15° C.

The extent of muscle necrosis was determined by weight. The leg was skinned down to the ankle and four muscles or muscle groups were separately prepared and weighed. These were (1) the tibialis anticus plus the extensor digitorum longus (2) the peroneus longus and the peroneus brevis (3) the flexor digitorum longus and (4) the gastrocnemius plus the soleus. The necrotic areas were usually sharply demarcated at the end of 1 week and were excised with scissors; the remaining healthy muscle was weighed again, and thus the proportion of necrotic tissue was determined. After the milder degrees of injury necrosis was as a rule limited to the tibialis anticus and extensor digitorum longus. For this reason in two series of animals exposed to 10° and 12° C. respectively the percentage of necrotic tissue was calculated with respect to the weight of these two muscles only.

In another article (10) we have shown that contrary to the general assumption, muscular necrosis precedes the necrosis of the skin and subcutaneous layers in the sequence of increasing injury. Superficial necrosis means in this report gangrene of the skin and the subcutaneous layers and is measured in square centimeters. Cutaneous and muscular necrosis do not display a simple relationship and, as will be shown, can be independently influenced by therapeutic measures. It was therefore necessary to determine cutaneous and muscular necrosis separately in all experiments to gain insight into the effect of rapid rewarming.

## RESULTS

*Clinical findings*—When the legs were removed from the warm bath they had a deep gray-blue hue. This cyanosis disappeared in about 30 minutes and was replaced by the deep red color of superficial vasodilatation which quickly became diffuse. Strangely when only the anterior muscle group was frozen solid the cyanosis after thawing was limited to the skin over these muscles.

(12) Pichotka, J. (Randolph Field, Tex.), and Lewis, R. B.: Prevention of secondary infection due to *Pseudomonas aeruginosa* in frostbitten tissue. *Proc. Soc. Exper. Biol. & Med.* 72: 127-130, Oct. 1949.

These authors showed that rapid rewarming definitely decreased the tissue loss after a standard cold injury. Our experiments were performed in order to repeat the previous investigations with a method of cold injury which permitted a more exact quantification of the results. It was hoped, at the same time, that some insight might be gained which would result in a more clearly differentiating effect of rapid rewarming on frostbitten tissue.

### MATERIALS AND METHODS

The experiments were performed on 314 male albino rabbits of usually more than 2,500 grams body weight. The animals were exposed to three different degrees of local cold injury for which the results had been established in a large number of animals (10). One hind leg of 310 animals cleanly shaved and covered with a snugly fitting rubber condom, was immersed for 30 minutes in an alcohol bath of 10° or 15° C. respectively as described in another article (11). After exposure part of the animals were left to spontaneous rewarming of the frozen leg in air at room temperature. This group served as controls. Rapid rewarming was performed with 168 animals and was accomplished by immersing the frozen leg in a water bath at 42° C. (blood heat of normal rabbit is about 39° C.) until thawing was complete; the water was kept in constant motion. Some animals struggled for short time in the warm bath but thereafter no reaction by the animal was observed.

Legs exposed to 10° and 12° C. for 30 minutes were generally rewarmed for 5 minutes. At the end of this period, most legs were completely thawed, some still displayed denser areas in the upper calf. After exposure to 15° C. for 30 minutes rewarming for 5 minutes often left large parts unthawed. Rewarming was continued in these cases until the solid areas were on the verge of disappearing. This usually required 2 or 3 additional minutes.

For the purpose of determining the effect of prolonged rewarming, 4 groups of 12 animals each were exposed to 2 standard cold injuries and immediately thereafter rewarmed for 15, 30, 60, and 120 minutes respectively. In each group, 6 animals were exposed to 12° C. for 30 minutes and 6 to 15° C. for 30 minutes.

Rewarming was accomplished as described in the first part of this article. The temperature of the water bath was maintained at 42° C. throughout the period of rewarming. One hundred and forty-two animals were left to spontaneous rewarming of the frozen leg in air at room temperature as controls. Except for rewarming all animals received the same treatment. The exposed leg was coated with mafenil

(10) Pacheco, J. Lewis, R. B. and Freytag, E. L. Sequence of increasing local cold injury. *Tex. Rep. Biol. & Med.* (in press).

(11) Pacheco, J. (Randolph F. Ld. Tex.), and Lewis, R. B. Use of heparin in treatment of experimental frostbite. *Proc. Soc. Exper. Biol. & Med.* 72: 130-136, Oct. 1949.

hydrochloride ointment and a sterile dressing applied (12). This dressing was changed daily until the fate of the leg was apparent. The animals were kept at a constant room temperature of 25° C. and received a standard diet (purina). Most of the animals were sacrificed and examined on the seventh or eighth day after exposure but some were kept for several weeks in order to study secondary changes. Four animals had both hind legs simultaneously exposed to cold for 30 minutes and one leg rapidly rewarmed in water at 42° C. for 5 minutes. The other leg was left to spontaneous rewarming in air at room temperature. For 2 of these the exposure temperature was 12° C. and for the others 15° C.

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In another article (10) we have shown that contrary to the general assumption, muscular necrosis precedes the necrosis of the skin and subcutaneous layers in the sequence of increasing injury. Superficial necrosis means in this report gangrene of the skin and the subcutaneous layers and is measured in square centimeters. Cutaneous and muscular necrosis do not display a simple relationship and as will be shown can be independently influenced by therapeutic measures. It was therefore necessary to determine cutaneous and muscular necrosis separately in all experiments to gain insight into the effect of rapid rewarming.

## RESULTS

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(12) Pichotka, J. (Randolph Field, Tex.), and Lewis, R. B.: Prevention of secondary infection due to *Pseudomonas aeruginosa* in frostbitten tissue. *Proc. Soc. Exper. Biol. & Med.* 72: 127-130 Oct. 1949.

It was seldom observed in our experiments that animals left to spontaneous rewarming regained the use of the frozen leg after thawing. Especially exposure to 15° C. for 30 minutes usually resulted in immediate partial flaccid paralysis. This was not true after rapid rewarming. Animals left to themselves after the leg was rewarmed in water at 42° C. for 5 minutes or more usually hopped with good use of the injured leg but paralysis of the injured leg was noticed in one of these animals when their dressings were changed the following day. The latter was especially true in animals exposed to 15° C. for 30 minutes. Those exposed to 12° C. and rapidly rewarmed usually retained excellent function of the injured leg until the time of death, whereas the animals spontaneously rewarmed but exposed to the same injury showed varying degrees of paralysis.

The effect of rapid rewarming on the extent of the resulting edema was interesting. Even though the edema appeared more rapidly in rewarmed legs than in those left to spontaneous rewarming, it was not always more severe. With the lesser degrees of injury (10° and 12° C. for 30 minutes) the edema in all groups was distinctly *less severe* and disappeared more quickly in the rapidly thawed legs than in those left to spontaneous rewarming. With the more severe injury (15° C. for 30 minutes), the *extent of edema* in rapidly thawed legs was generally *less* than in spontaneously rewarmed legs. By comparison of these two groups it was sometimes strikingly apparent that the extent of edema was not a reliable measure of the degree of injury. Animals with little or no final necrosis often displayed more edema prior to the development of necrosis than did animals which suffered extensive gangrene.

TABLE I.—*Effect of rapid rewarming on the incidence of superficial necrosis in animals exposed to 12° C. and 15° C. for 30 minutes*

Bath temperature	Number of animal	Treatment	Complete loss of leg	Number with superficial necrosis	Number without superficial necrosis	Died
12° C.	75	Rewarmed in water at 42° C. for 5 minutes	0	0	75	0
	51	Rewarmed in air at room temperature	0	13	38	0
15° C.	39	Rewarmed in water at 42° C. for 5 to 8 minutes	0	3	35	1
	53	Rewarmed in air at room temperature	13	17	2	1

*Superficial (cutaneous) necrosis*.—The incidence and extent of cutaneous necrosis were determined by sacrificing and examining the animals on the seventh or eighth day after exposure. According to our

experience with rabbits the final demarcation of the primary necrosis was complete at this time. Table 1 shows the incidence of superficial necrosis after rapid thawing and spontaneous rewarming in air for animals exposed to 12° and 15° C. for 30 minutes. The chi square test for the distribution of cases exposed to 12° C. with superficial necrosis was highly significant ( $P$  was less than 0.001). According to our experience (10) with this degree of injury we could expect 15 of the 75 cases to result in superficial necrosis if they had been left to spontaneous rewarming.

In the group exposed to 15° C. the chi square test for the distribution of cases with and without superficial necrosis showed that this result was also highly significant ( $P$  was less than 0.001). According to our experience (10) we could expect 35 of the 38 animals that survived to display superficial necrosis after this degree of injury if they had not been rapidly thawed.

The findings are still more convincing if the extent of skin necrosis is considered. In one experiment 24 animals were exposed to 15° C. for 30 minutes and quickly thawed in water at 42° C. for from 5 to 8 minutes and 24 similarly exposed were left to spontaneous rewarming. In both groups 23 animals survived. In the rapidly rewarmed group only 1 suffered skin necrosis amounting to 2 square cm. In the group left to spontaneous rewarming 22 animals suffered skin necrosis with a total of 479 square cm. effected.

*Deep (muscular) necrosis*—The effect of quick thawing on the extent of muscular necrosis was less clear. The first determinations of muscular necrosis were performed on a group of 54 animals exposed to 12° C. for 30 minutes. Eighteen of these were left to spontaneous rewarming at room temperature and 36 were thawed rapidly by immersion in water at 42° C. for 5 minutes. After 8 days the animals left to spontaneous rewarming displayed the usual sharply demarcated dull brown, indurated muscular necrosis. The extent of necrosis in this group was higher than usual but still within the range typical for this degree of injury (table 2, series A).

The muscles of the quickly thawed legs looked different, as a rule. The distribution and localization of necrotic and nonnecrotic areas were exactly the same as in animals left to spontaneous rewarming. In general when muscular necrosis was present in rapidly-thawed legs the line of demarcation between viable and nonviable tissue was not distinct. The yellow or brown necrotic areas were separated from the definitely pink, living muscle by a narrow zone of gray or yellow-gray tissue. The percentage of muscular necrosis was calculated with respect to the total weight of the four muscle groups described previously.

The interpretation of the results of the experiments on muscular necrosis depends on the significance of the differences of the mean



TABLE 2.—*Effect of rapid rewarming on the extent of muscular necrosis in animal exposed to 10° C, 12° C, and 15° C, for 30 minutes*

Number of animals	Series	Exposure temperature	Treatment	Interval between injury and autopsy	Muscular necrosis (percent)
36	A	12° C.	Rewarmed in water at 42° C. for 5 minutes	8 days	43.0 ± 3.3
18			Rewarmed in air at room temperature		48.1 ± 3.8
15	B	12° C.	Rewarmed in water at 42° C. for 5 minutes	8 days	49.7 ± 9.6
14			Rewarmed in air at room temperature		63.9 ± 7.1
15	C	10° C.	Rewarmed in water at 42° C. for 5 minutes	8 days	25.5 ± 6.8
14			Rewarmed in air at room temperature		42.6 ± 7.6
23	D	15° C.	Rewarmed in water at 42° C. for 5 to 8 minutes	8 day	53.9 ± 4.8
24			Rewarmed in air at room temperature		69.9 ± 4.0
24	E	12° C.	Rewarmed in water at 42° C. for 5 minutes	3 weeks	6.5 ± 1.0
24			Rewarmed in air at room temperature		20.8 ± 3.2
14	F	12° C.	Rewarmed in water at 42° C. for 5 minutes	3 weeks	3.4 ± 1.5
8			Rewarmed in air at room temperature		9.8 ± 3.4

values. Because our observations of percentage of necrosis do not show normal distribution, nonparametric test of significance was applied. The test used (13) provides for the calculation of a statistic which is distributed approximately as Student's *t*. The results were not statistically significant. The *t* test yielded a *P* of 0.392 with 52 degrees of freedom. It was not possible to decide from the gross appearance whether those are between necrotic and obviously viable tissue in the rapidly rewarmed legs would survive or eventually become

(13) Pitman, E. J. Significance tests which may be applied to samples from any population. *Supplement Journal Royal Statistical Society* 4: 119-130, June 1937

necrotic. There were indications that at least a large part of this changed tissue might only be in the state of severe atrophy. As shown in another article (10), primary necrosis of muscle leads to an increase in weight, while a slightly lesser injury may result in marked atrophy with a loss in weight. In animals left to spontaneous rewarming, the muscles of the exposed leg showed on the average an increase in weight if compared to the unexposed leg of 4.3 percent, but the muscles of the quickly thawed legs lost on the average 2.8 percent by weight.

To gain more insight into the results of rapid rewarming 30 animals were exposed to 12° C. for 30 minutes. Fifteen were thawed at room temperature as controls (1 died before the fate of the leg was determined) and 15 were rapidly rewarmed in water at 42° C. for 5 minutes. All animals were sacrificed after 8 days. With this degree of cold injury it has been our experience that in almost all instances only the anterior muscles of the leg (tibialis anticus plus extensor digitorum longus) show visible gross necrosis. For this reason, we disregarded the other muscles of the leg and determined only the percentage of necrosis in these two muscles. The gray tissue forming the border between necrotic and definitely viable muscle was not considered necrotic.

The mean muscular necrosis in the rapidly rewarmed and control animals is given in table 2 series B. The *t* test for the difference between the two groups yielded a *P* of 0.26 with 27 degrees of freedom. This was not significant.

Another group of 30 animals was exposed to 10° C. for 30 minutes. Fifteen were rewarmed in air at room temperature and served as controls (of this group 1 died before the results became apparent) and 15 were rapidly rewarmed in water at 42° C. for 5 minutes. All animals were sacrificed and examined after 8 days. As in the preceding series only the percentage of necrosis in the tibialis anticus and extensor digitorum longus was determined since no other muscles became involved in the necrotic process with this degree of injury. Again, the gray zones bordering the necrotic areas were considered viable. The average muscle necrosis in the two groups is given in table 2 series C. The difference was not significant because the *t* test yielded a *P* of 0.1 with 27 degrees of freedom.

The extent of muscular necrosis in animals exposed to 15° C. for 30 minutes and rapidly thawed or left to spontaneous rewarming in air was determined 8 days after exposure in a group of 48 animals (table 2 series D). Of these 24 animals were rapidly rewarmed in water at 42° C. (of this group 23 survived) and 24 were spontaneously thawed at room temperature. The appearance of the necrotic parts in the rapidly and spontaneously rewarmed animals showed differences. In the spontaneously rewarmed animals the necrotic parts were compact and homogeneously discolored with sharp and straight lines of demarcation.

The necrotic areas were often sharply protruding at this line. In the rapidly rewarmed animals the demarcation between necrotic and non-necrotic muscle was irregular but distinct with this degree of injury. Narrow or wide tongues of healthy tissue extended along the fascias into otherwise necrotic areas. At times tiny yellow areas of necrosis were scattered throughout viable muscle giving the tissue a speckled appearance. The necrotic parts were irregularly discolored, less indurated, and less protruding than in the other group. The percentage of muscle necrosis was calculated with respect to the four muscle groups described previously and the results incorporated in table 2, series D. There was significant difference between the results in the rapidly and spontaneously rewarmed animals ( $P = 0.019$  with 45 degrees of freedom.)

One point concerning muscle weights deserves explanation. When the unexposed hind leg was used for comparison the muscles of the spontaneously rewarmed legs showed, on the average, a 17.6 percent gain in weight, but the muscles of the rapidly rewarmed legs on the average maintained their total weight (the apparent gain of 2.1 percent is not significant). The weight increase occurred only in the necrotic parts; the remainder of the muscle tissue, on the other hand, displayed atrophy.

In figure 1 the extent of necrosis in 47 animals exposed to 15° C. for 30 minutes (23 rapidly rewarmed and 24 controls) is given with respect to the change in the total muscle weight of the exposed leg. The total muscle weight was decreased in cases with relatively little muscular necrosis in rapidly rewarmed animals because of atrophy of the surviving portion. More extensive necrosis was associated with a marked increase in total weight (in the spontaneously rewarmed animals). Because the gain in weight occurred exclusively in the necrotic part, the given proportion of the necrotic tissue was always too high. This deviation increased with increasing extent of the necrotic areas. For the purpose of establishing a difference between two groups of values with the same conditions, i. e., comparing legs exposed to the same cold injury, this behavior of the underlying function was of no concern because the function was in itself continuous.

There seemed to be a relation between the weight increase of necrotic muscles and the severity of injury by which it was caused. More severe injuries resulted in a more extensive necrosis and in a greater weight gain of the necrotic part. With rapid thawing this weight gain was diminished or prevented.

We are unable to interpret these results adequately. It is certain that rapid rewarming had a definite influence on the appearance of the injured muscles. In general this influence seemed to be beneficial, but whether the described differences in the appearance of the injured muscles were significant could be shown only by further experiments. Several groups of animals exposed to the same cold injury were sacrificed and examined 3 and 5 weeks after the exposure. We expected

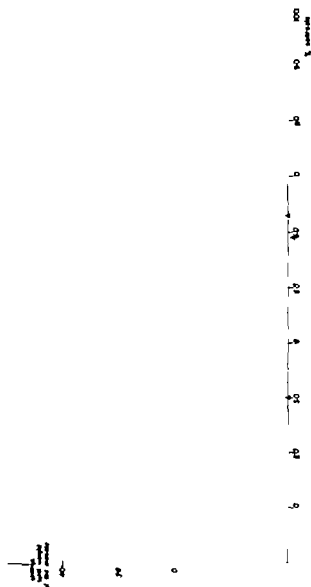


Figure 1.—Distribution of changes in muscle weight in rapidly and slowly rewarmed legs with respect to the extent of necrosis. Solid triangles represent muscle weights of animals rapidly thawed after exposure to cold injury. Open triangles represent muscle weights of animals left to spontaneous rearming in air.

that after this interval the fate of the muscles would be more apparent. The percentage of muscular necrosis was calculated with regard to the total weight of the four muscle groups described previously.

Forty-eight animals were exposed to 12° C. for 30 minutes (table 2, series E). Half of them were rapidly rewarmed in water at 42° C. for 5 minutes; the other half were left to spontaneous rewarming. Autopsies were performed 3 weeks after exposure. The leg muscles in both groups displayed a severe atrophy of the same order. The legs left to spontaneous rewarming lost an average of 21.5 percent of their total weight in comparison to the unexposed leg. Rapidly rewarmed legs lost an average of 24 percent as compared to the unexposed leg. The necrotic areas were compact, sharply limited, and without structure. There was a difference in color. Necrotic areas in the quickly thawed cases usually had a green hue while the destroyed areas in the spontaneously rewarmed legs were gray-brown. The extent of the necrotic part was much different in the two groups. The average muscular necrosis for the two groups is shown in table 2, series E. Statistical analysis showed that the difference in the results of the two groups was significant at the 1 percent level. The *t* test yielded a *P* of 0.01 with 46 degrees of freedom. These values for the necrotic portion cannot be compared to those determined 8 days after exposure. After 3 weeks the total weight of the muscles was greatly decreased and part of the necrotic muscle tissue was absorbed and partially replaced with fibrous tissue. Nevertheless, we believe that the result is a good representation of the differences in the final injury.

A second series of 24 animals was exposed to the same conditions (12° C. for 30 minutes) and sacrificed and examined 5 weeks after exposure. Fifteen of these animals were rapidly rewarmed until thawing was complete and 9 were left to spontaneous rewarming. One animal of each group died. At autopsy the atrophy was again of the same order of magnitude in rapidly and spontaneous rewarmed legs (20.9 and 17.5 percent, respectively). Of the 14 rapidly rewarmed legs 10 were without grossly visible muscular necrosis. All 8 animals left to spontaneous rewarming displayed grossly necrotic muscle; the average muscle necrosis for all animals of this group is shown in table 2, series F. The results were significant at the 6 percent level (*P* = 0.064 with 20 degrees of freedom). The fibrosis of the injured part of the muscles was much more pronounced in animals left to spontaneous rewarming.

Most convincing were the results in a group of animals exposed to 15° C. and sacrificed and examined 5 weeks after exposure. Of 24 animals 21 survived, 9 of which were left to spontaneous rewarming while the other 12 were rapidly thawed in water at 42° C. for from 5 to 8 minutes. Of the 12 animals rapidly rewarmed, none suffered superficial necrosis and, with the exception of 1 animal which incurred fracture in the ankle joint, they regained moderate to good use of the injured leg and foot. In 3 cases the spreading reflex of the toes was

restored. Of the 9 animals left to spontaneous rewarming all but 1 suffered extensive necrosis of the skin. 2 completely lost a leg and only 1 regained moderate use of the leg and foot after the cutaneous necrosis healed. In 7 of the 9 cases extensive liquefaction and sequestration were found in the muscles of the injured leg. In these cases even a moderate restoration was precluded. It was astonishing to see

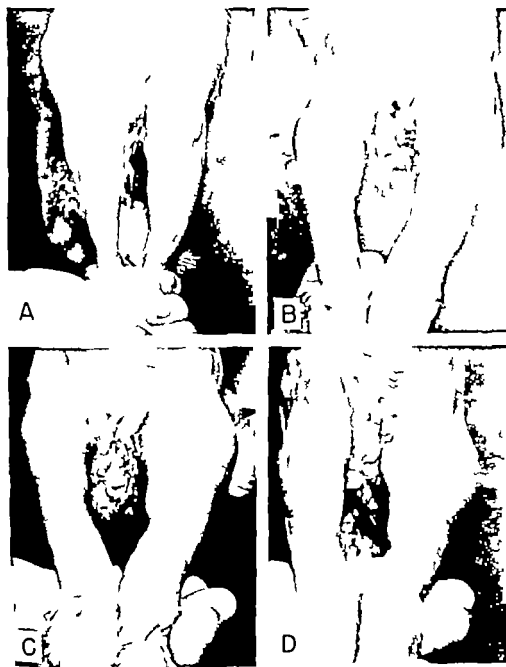


Figure 2.—The edema of the rapidly thawed right leg (shown on left side) is much less than that in the spontaneously rewarmed left leg. (A) Fifteen minutes after exposure. (B) Two hours after exposure. (C) Five hours after exposure. (D) Twenty-four hours after exposure.

that the tendons and fascias usually escaped necrosis so that even small remnants of muscle tissue were still connected to their tendons.

There were no compact necrotic areas such as we observed from 1 to 2 weeks after exposure in the legs of animals left to spontaneous rewarming. The lines of demarcation were not straight as in spontaneously rewarmed animals but were distorted by many small processes of healthy tissue extending into the grossly necrotic areas. On cut surfaces many irregularly outlined small islands of surviving tissue could be found surrounded by necrosis. Especially all connective tissue structures were accompanied by surviving muscle. These areas of viable tissue were often bordered by a fine hemorrhagic line. The necrotic parts were obviously slowly absorbed and partially replaced by fibrous tissue. There were no signs of liquefaction or sequestration of the necrotic muscle. Partial function of the atrophied and fibrotic muscles was obviously maintained. It was not possible quantitatively to compare the muscular necrosis in the two groups because of the interspersation of necrotic and viable muscle in the rapidly rewarmed animals and the liquefaction, probably secondary to infection of the necrotic skin, present in the gangrenous muscle in spontaneously rewarmed animals.

Better to compare the differences between the results of rapid and spontaneous rewarming the following experiment was performed. Four

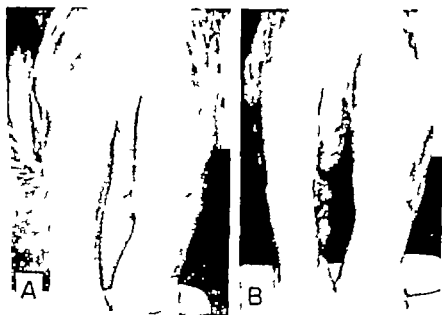


Figure 3.—(Same rabbit as shown in figure 2.) The pictures taken after 2 and 3 days show the beginning of a limited superficial necrosis on the lateral aspect of the left leg (A) Two days after exposure. (B) Three days after exposure.

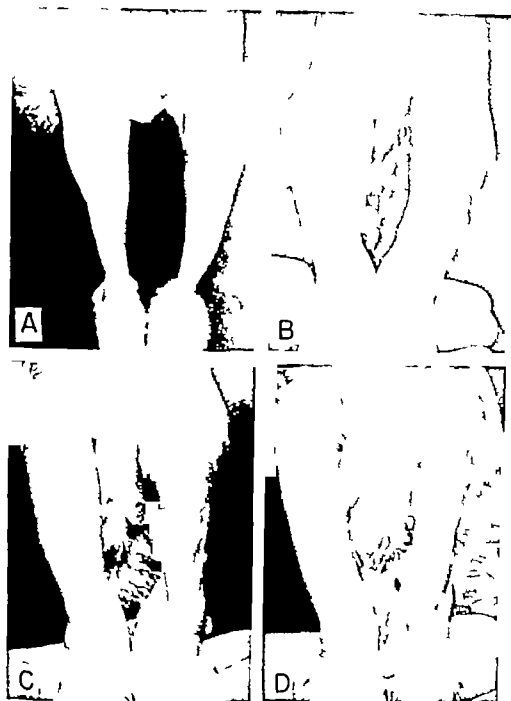


Figure 4.—After 24 hours the rapidly rewarmed right leg (shown on left side) displayed the more extensive edema. The right leg at this time was not discolored, but an irregular cyanotic discoloration was present over the entire left leg. After 2 days large part of the spontaneously rewarmed left leg became necrotic. The necrosis was more extensive after 3 days, at which time the edema of the right leg had almost disappeared, and the leg appeared quite healthy. The animal died from the cold injury 4 days after exposure. (A) Fifteen minutes after exposure. (B) Twenty-four hours after exposure. (C) Two days after exposure. (D) Three days after exposure.



animals had both hind legs simultaneously exposed to cold injury. 2 animals were exposed to 12° and 2 to 15° C. for 30 minutes. After exposure the right legs of all 4 animals were rapidly thawed in water at 42° C. for 5 minutes and the left legs in air at room temperature. The 2 animals exposed to 12° C. developed small areas of cutaneous necrosis on the spontaneously rewarmed legs. The rapidly rewarmed legs were without visible injury after 1 week (figs. 2 and 3). At autopsy of the animal shown in figures 2 and 3 8 days after exposure 16 percent of the muscle in the right leg and 44 percent of the muscle in the left leg was necrotic. The animals exposed to 15° C. showed no superficial necrosis of the rapidly rewarmed legs while both legs of the animals left to spontaneous rearming showed extensive cutaneous necrosis (fig. 4). At autopsy of the animal shown in figure 4, 79 percent of the muscle in the right leg and 76 percent of the muscle in the left leg was necrotic.

#### EFFECT OF PROLONGED REWARMING

The effect of prolonged rearming on the result of a standard cold injury was investigated because it is important to know whether the beneficial effect of rapid thawing as described above will be increased or decreased by extending the period of rearming. Furthermore if the hypothesis that the necrosis after cold injury is caused by ischemia is correct, raising the tissue temperature and thereby increasing local metabolism would be deleterious. For this investigation 48 animals were divided into groups exposed, and rewarmed in water at 42° C. for 15, 30, 60 or 120 minutes as previously described. The animals were sacrificed and examined from 6 to 8 days after exposure and the occurrence and the extent of cutaneous and muscular necrosis were determined. The results are shown in table 3.

The results for the animals exposed to 12° C. were on the average distinctly better than in animals similarly exposed and left to spontaneous rearming. The extent of muscular necrosis in the group rewarmed for 60 minutes was in the same range as the average for spontaneously rewarmed animals but this was obviously accidental. Such small groups are unduly influenced by a single high value as was the case here. The results of exposure to 15° C. showed for all periods of rearming the same magnitude of the extent of muscular necrosis and were in the same range as observed in similarly exposed animals spontaneously rewarmed. With regard to the occurrence and extent of cutaneous necrosis, the groups rewarmed for from 15 to 60 minutes were definitely better than animals left to spontaneous rearming. The group rewarmed for 2 hours showed the same behavior as the other groups as far as muscular necrosis was concerned, but in all 6 animals of this group superficial necrosis occurred as would have been expected with spontaneous rearming. It is possible but not certain, that this may have been the result of the prolonged rearming.

TABLE 3.—*Influence of prolonged rewarming on the extent of muscular and cutaneous necrosis after exposure to 12° C. and 15° C. for 30 minutes*

Bath temperature	Number of animal	Period of rewarming (minutes)	Extent of muscular necrosis (percent)	Cutaneous necrosis
12 C.	6	15	17 ± 2.9	0
	6	30	24 ± 5.3	0
	6	60	57 ± 12.3	0
	6	120	17 ± 4.4	0
15 C.	5	15	66 ± 11.3	1 case with 6 square cm.
	6	30	55 ± 7.6	0
	5	60	74 ± 3.6	0
	6	120	59 ± 7.9	6 ca. totaling 100 square cm.

## GENERAL OBSERVATIONS

The animals with quickly thawed legs appeared on the whole to remain in much better general condition than those left to spontaneous rewarming. As a rule the latter lost weight in the week following exposure. This was not the case in animals whose legs were rapidly thawed. The weight loss was especially impressive when the different amounts of retroperitoneal fat were noted at autopsy. After quick thawing the animals in most instances maintained a normal amount of fat in this area, while after spontaneous rewarming the retroperitoneal fat largely disappeared. The incidence of severe diarrhea after exposure, a common feature after local cold injury, was much less frequent after quick thawing. Animals whose injured legs had been thawed rapidly did not exhibit the severe illness which was otherwise the rule. On the other hand there were some particular features in the group of animals with rapidly thawed legs. They obviously suffered much pain from the injured leg. We observed in this group several animals which chewed off parts of the exposed but apparently healthy legs. According to our experience this is unusual behavior in rabbits.

## DISCUSSION

The results of our investigation show convincingly that rapid thawing of a leg solidified by short exposure to low temperatures resulted in less extensive necrosis than slow thawing. With one standard cold injury (12° C. for 30 minutes) resulting in partial necrosis of the skin in about 20 percent of the cases after spontaneous thawing in air, the occurrence of superficial necrosis was completely prevented by rapid thawing in water at 42° C.

More convincing still were the results of rapid thawing after exposure to 15° C. for 30 minutes. After spontaneous thawing in air 90 percent of the animals usually displayed extensive necrosis of the skin. With rapid thawing the rate was reduced to 3 of 38 animals and the necrotic areas in these were small. Of 23 animals thawed spontaneously in air after exposure 22 suffered from superficial necrosis of the exposed leg comprising a total area of 479 square cm. The corresponding group of rapidly thawed animals showed superficial necrosis in 1 of 23 cases amounting to 2 square cm. When extensive cutaneous necrosis occurred in our experiments the entire leg was lost. A surface necrosis of 30 to 40 square cm. invariably resulted in total necrosis of the leg. This total loss of the injured leg, occurring in about 40 percent of the cases when slowly thawed was avoided by rapid warming.

The influence of rapid thawing on the extent of muscular necrosis was much less conspicuous, but, nevertheless showed a definite trend toward improvement. In animals left to spontaneous rewarming, the extent of muscular necrosis was well defined after 7 or 8 days. At this time the compact necrotic areas were sharply demarcated. In animals with rapidly rewarmed legs the extent of the primarily affected area was obviously the same but this area did not become completely necrotic. The necrosis after 1 week was well developed in most cases, but its outline was essentially irregular in comparison to the conditions in spontaneously rewarmed legs. The final result showed that islands of muscle tissue within the primarily affected areas survived. This surviving tissue was straggled as fingerlike processes or islands usually in connection with fascias or other connective tissue structures.

Because of the decrease in the extent of the resulting necrosis of skin and muscle rapidly rewarmed animals usually regained moderate or good use of the leg and foot even after exposure to 15° C. for 30 minutes. Animals left to spontaneous rewarming after the same degree of injury lost, primarily or secondarily the exposed leg in almost half the cases and seldom regained a comparable degree of function. The liquefaction and destruction of the damaged tissue by pus formation, usually observed in these cases were probably caused by late infection of necrotic parts of the skin.

The almost complete prevention of cutaneous necrosis by rapid rewarming showed that primary damage to the vessels cannot be the cause of the local gangrene. The reduction of the extent of muscular necrosis suggests the same conclusion. If damage to the blood vessels with subsequent thrombosis was the cause of necrosis following local injury the favorable results of rapid rewarming would not be understandable. The thrombosis of large parts of the subcutaneous vascular system, which was often observed during the development of superficial necrosis must, therefore be secondary in the chain of

events. The basic injury must involve a process or system that is influenced essentially by rapid rewarming.

The distinctly lesser effect of rapid thawing in the prevention of muscular necrosis allows for either of two explanations. The susceptibility of muscle to cold injury is so much greater that, under our experimental conditions, the muscles were already largely damaged beyond repair, whereas the more resistant skin was saved by rapid rewarming. The other possibility is that the conditions of rewarming were much more favorable for the skin. Both explanations are supported by the facts.

Prolonged rewarming in water at 42° C. up to 1 hour did not produce deleterious results but had the same beneficial influence as rapid thawing for only 5 to 8 minutes. The rapid increase in temperature and in local metabolism of the part injured by cold was obviously not harmful, but beneficial. This shows again that the concept of a primary interruption of the local circulation as the cause of the resulting necrosis cannot be correct. The extensive superficial necrosis after 2 hours' rewarming at 42° C. cannot be explained until we have further insight into the underlying mechanisms of local cold injury and the effect of quick rewarming.

With the few exceptions mentioned in the introduction students of this problem insist on slow thawing and rewarming of frozen limbs. The popular observation that slow rewarming diminishes the appearance of edema and pain is certainly one of the premises of this conclusion, but this assumption received strong support from a rather general hypothesis, i. e. that the final cause of tissue necrosis after frostbite is the result of oxygen lack caused by the local interruption of the circulation by vasoconstriction stasis with clumping of red blood cells or thrombosis. From experiments which showed that tissue deprived of circulation survived longer the lower the environmental temperature it was concluded that low temperature is most beneficial to frostbitten tissue (14). The appearance of pain with increasing temperature of the affected part was construed to be a bad symptom. Prevention of pain by keeping the temperature in the injured part at a low level was therefore considered an important part of the treatment (15). It is difficult to decide how far this concept is justified. The metabolic conditions of frostbitten limbs have never been investigated. Our knowledge concerning this has been derived from analogous situations.

A rational therapeutic approach has to consider the final outcome only, i. e. loss of tissue and impairment of function. Temporary symptoms such as swelling and pain are important only as they influence the final result. It would be important to know whether 42° C. is the

(14) Allen, F. M.: Surgical consideration of temperature in ligated limbs. *Am. J. Surg.* 43: 459-464, Sept. 1939.

(15) Allen, F. M.: Experiments concerning ligation and refrigeration in relation to local intoxication and infection. *Surg., Gynec. & Obst.* 68: 1047-1051, June 1939.

More convincing still were the results of rapid thawing after exposure to 15 C. for 30 minutes. After spontaneous thawing in air, 90 percent of the animals usually displayed extensive necrosis of the skin. With rapid thawing the rate was reduced to 3 of 38 animals and the necrotic areas in these were small. Of 23 animals thawed spontaneously in air after exposure 22 suffered from superficial necrosis of the exposed leg comprising a total area of 479 square cm. The corresponding group of rapidly thawed animals showed superficial necrosis in 1 of 23 cases amounting to 2 square cm. When extensive cutaneous necrosis occurred in our experiments the entire leg was lost. A surface necrosis of 30 to 40 square cm. invariably resulted in total necrosis of the leg. This total loss of the injured leg, occurring in about 40 percent of the cases when slowly thawed, was avoided by rapid warming.

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(14) Allen, F. M. Surgical consideration Surg. 43: 499-504, Sept. 1950.

(15) Allen, F. M. Experimental local ischaemia and infection.

optimum temperature for rewarming frostbitten tissue. Finoceran and Shumacker (9) determined quantitatively the effect of various rewarming temperatures on the extent of necrosis of mouse tails frozen at  $15^{\circ}\text{C}$ . for 5 seconds. Of the three temperatures investigated for rewarming ( $38^{\circ}$ ,  $42^{\circ}$  and  $50^{\circ}\text{C}$ ),  $42^{\circ}\text{C}$ . gave the best results. The good results obtained by several investigators (6, 8, 9), as well as ourselves by rewarming at  $42^{\circ}\text{C}$ ., are at variance with the conclusions of Arey (5), who has emphasized that the temperature of the rewarming bath must not be higher than body temperature. He believed the overheating of tissue with higher bath temperatures to be deleterious.

### CONCLUSIONS

Rapid thawing of frozen legs in water at  $42^{\circ}\text{C}$ . for 5 to 8 minutes almost entirely prevented cutaneous necrosis after exposure to  $12^{\circ}$  and  $15^{\circ}\text{C}$ . for 30 minutes. Spontaneous rewarming in air at room temperature after these two standard injuries in these and previous experiments resulted in superficial necrosis in 20 and 90 percent of cases respectively. The extent of muscular necrosis was definitely decreased by rapid thawing, but the results were not so striking as in the case of cutaneous necrosis. Prolonged rewarming with water at  $42^{\circ}\text{C}$ . up to 1 hour gave in all cases the same beneficial influence as rapid thawing for only 5 to 8 minutes. Animals with rapidly rewarmed legs exhibited a better general appearance than animals left to spontaneous rewarming and preserved better function of the injured limbs.

# Epidemic Typhus Vaccine

## Antibody Response to a Single Dose Among Persons Previously Vaccinated

Ross L. Gauld M. D. Dr P. H. (1)

Kenneth Goodner Ph. D. (2)

ALL personnel in the Armed Forces of the United States are vaccinated against epidemic typhus fever before proceeding to assignments overseas. The initial vaccination consists of a series of 2 doses of vaccine given from 7 to 10 days apart and thereafter single booster injections are given each year generally at the commencement of the typhus season. With this schedule it is possible to maintain a relatively high antibody level among those vaccinated (3) but the interval which may be allowed to elapse between booster doses and still evoke a satisfactory response has not been determined. Our purpose in this article is to present data summarizing the findings obtained when volunteers were given a single dose of epidemic typhus vaccine from 3 to 5 years after their last previous dose. The history of these volunteers with respect to typhus vaccination is similar to that of the millions of Americans who served overseas in the Armed Forces in World War II.

### MATERIAL AND METHODS

**Vaccine.**—A commercial vaccine (Lederle L 2124 1043A) was obtained through regular Army supply channels. This vaccine had passed the standard National Institutes of Health assay test before release to the Army. The bottle carried the expiration date of 15 May 1950 and was used in December 1949. At the time this vaccine was used it titrated 1:16 against 4 units of serum in a direct complement-fixation test. This test was used as an abbreviated method for a rapid single check of the presence of typhus complement fixing antigen. Most commercial lots of typhus vaccine fix complement in this general range.

(1) Department of Virus and Rickettsial Diseases, Army Medical Service Graduate School, Army Medical Center, Washington, D. C.

(2) Department of Bacteriology and Immunology, Jefferson Medical College of Philadelphia.

(3) Topping, N. H.; Bengtson, I. A.; Henderson, R. G.; Shepard, C. C., and Shear, M. J.: Studies of Typhus Fever. From the Division of Infectious Diseases, National Institute of Health, Federal Security Agency, United States Public Health Service, National Institute of Health Bulletin No. 183, 1945, pp. 65-86.



**Volunteers.**—Fifty-five students at The Jefferson Medical College of Philadelphia volunteered to receive a single dose of the vaccine. All of these men were veterans who had served in the Armed Forces during World War II and had not received typhus vaccine since their separation from the services. The military or naval immunization records of all volunteers were obtained. The intervals elapsing between the last dose of typhus vaccine while in the Armed Forces and the single booster injection given in this study are summarized in table 1.

TABLE 1.—Interval between last dose / vaccine and booster injection

Interval	Number of volunteers
5-6 years	15
4-5 years	25
3-4 years	11
2 years 10 months	1
Unknown, but over 4 years	3

**Procedure.**—Two days after a prevaccination bleeding the volunteers were each given a single 1 ml. dose of epidemic typhus vaccine subcutaneously. Following this injection all subjects reported soreness at the site of inoculation and 14 had additional symptoms. These reactions, however, did not appear to be more severe than those usually encountered with epidemic typhus vaccine. Postvaccinal bleedings were made on 11 volunteers from 38 to 40 days following the vaccination. The serums from both the pre- and post-vaccinal bleedings were refrigerated and sent by courier to the Department of Virus and Rickettsial Diseases, Army Medical Service Graduate School for laboratory tests. Complement-fixation tests for epidemic typhus were performed on all specimens obtained, care being taken to test the paired serums of each person in the same test. In addition, rickettsial agglutination and neutralization tests were made on the serums of a small group of selected subjects. The techniques employed in the various tests were those routinely used at the Army Medical Service Graduate School (4).

### FINDINGS

**Complement fixing antibodies.**—The results of the complement fixation tests for epidemic typhus made on paired serums collected before and after the booster dose of vaccine are summarized in table 2. Of the 55 prevaccination serums, only 5 had a complement-fixation titer of 1:8 or better and 35 were entirely negative at the lowest dilution (1:2) tested. Although these subjects had little, if any circulating antibody before receiving the vaccine, they responded well to the single booster dose. Serums collected from 38 to 40 days postvaccination showed at least fourfold rises over the prevaccination titer in all but 2 subjects. The serum of one of these (No. 45) fixed complement at

(4) Platz, H., Bennett, D. L., Veronesi, E., Snyder, M. J., and Gould, R. L. Serological picture in typhus fever; I. epidemic. *Am. J. Hyg.* 47: 150-165, Mar. 1948.

TABLE 2.—Antibody response of 55 volunteers to a single dose of epidemic typhus vaccine

Volunteer	Number of booster doses of vac	Interval since last dose (Years and months)	Epidemic typhus complement-fixation titer		
			Pre-vaccination	Post vaccination	
1	3	5	9	Neg.	1:64
2	1	5	8	Neg.	1:64
3	1	5	7	N g.	1:32
4	1	5	7	1:16	1:64
5	1	5	4	Neg.	1:32
6	1	5	4	Neg.	1:128
7	0	5	3	N g.	1:64
8	0	5	2	N g.	1:64
9	1	5	2	N g.	1:128
10	2	5	2	1:2	1:128
11	0	5	1	Neg.	1:64
12	0	5	1	N g.	1:128
13	2	5	0	Neg.	1:128
14	2	5	0	1:2	1:128
15	0	5	0	Neg.	1:128
16	1	4	11	1:4	1:32
17	2	4	11	1:8	1:128
18	0	4	11	1:4	1:64
19	1	4	9	N g.	1:32
20	1	4	9	Neg.	1:16
21	2	4	8	Neg.	1:16
22	1	4	7	Neg.	1:64
23	1	4	7	1:2	1:256
24	2	4	5	1:8	1:32
25	1	4	4	1:2	1:128
26	1	4	4	Neg.	1:16
27	0	4	4	Neg.	1:128
28	0	4	3	Neg.	1:16
29	1	4	3	Neg.	1:16
30	0	4	3	Neg.	1:128
31	1	4	3	1:8	1:32
32	2	4	2	1:8	1:16
33	1	4	2	1:4	1:64
34	3	4	1	N g.	1:16
35	3	4	1	1:4	1:32
36	1	4	0	N g.	1:64
37	0	4	0	Neg.	1:128
38	4	4	0	N g.	1:64
39	2	4	0	1:2	1:64
40	2	4	0	1:2	1:64
41	2	3	11	N g.	1:16
42	3	3	10	Neg.	1:32
43	1	3	9	N g.	1:16
44	3	3	9	1:2	1:32
45	3	3	9	1:64	1:64
46	2	3	8	Neg.	1:16
47	2	3	7	Neg.	1:16
48	0	3	7	Neg.	1:32
49	3	3	5	1:4	1:64
50	1	3	4	N g.	1:128
51	0	3	3	N g.	1:64
52	0	2	10	N g.	1:128
53	?	4	?	1:2	1:16
54	?	4	?	Neg.	1:4
55	?	4	?	1:2	1:32

\*In addition to initial series.

1:64 before vaccination and his postvaccination specimen titrated at the same level. The other (No. 32) showed a titer of 1:8 at the time of the prevaccination bleeding and showed only a 1-tube rise to 1:16 after vaccination. The vast majority of the subjects had good response to the booster and 47 of the 55 had at least a 4-tube (sixteenfold) increase in titer while in 11 the rise was 7 tubes or more.

*Neutralizing and agglutinating antibody*—In a small group of subjects the antibody reaction was also measured by means of neutralization and rickettsial agglutination tests. The immunologic responses of these men as shown by the different techniques are summarized in table 3. The results obtained by the 3 tests employed are in good agreement with respect to the antibody rise. Those subjects who had satisfactory antibody rises when the complement-fixation test was employed also had satisfactory rises when the agglutination and neutralization tests were used. At the same time volunteer No. 45 who had no rise in complement-fixing antibody showed only a twofold rise by the neutralization technique and a fourfold rise (1:80 to 1:320) in agglutinating antibody. The tests with specific murine typhus antigen indicate that the rise in antibody to epidemic typhus was also accompanied by some rise in murine typhus antibody.

TABLE 3.—Antibody response of 7 volunteers to a booster dose given from 3 to 5 yrs after last injection of epidemic typhus vaccine

Number	Complement fixation				Rickettsial agglutination				Neutralization	
	Epidemic typhus	Murine typhus	Epidemic typhus	Murine typhus	Epidemic typhus	Murine typhus	Epidemic typhus	Murine typhus	Epidemic typhus	Murine typhus
	Before	After	Before	After	Before	After	Before	After	Before	After
15	Neg.	1:128	Neg.	1:32	1:40	1:320	Neg.	1:80	1:4	1:512
18	1:4	1:64	1:4	1:8	1:40	1:160	1:20	1:40	1:8	1:256
23	1:2	1:256	—	—	—	—	—	—	1:4	1:1024
34	Neg.	1:4	Neg.	Neg.	1:20	1:160	Neg.	1:40	Neg.	1:32
45	1:64	1:64	1:8	1:16	1:80	1:320	1:20	1:80	1:128	1:256
57	Neg.	1:128	1:2	1:16	1:40	1:160	Neg.	1:80	1:4	1:512
6	Neg.	1:128	Neg.	1:64	1:40	1:320	1:20	1:160	1:4	1:512

## DISCUSSION

In this study we did not attempt to define the frequency with which booster doses of epidemic typhus vaccine must be given in order to maintain a satisfactory antibody level among those potentially exposed to infection. Furthermore we did not consider the more theoretical question of whether it is necessary to maintain measurable antibody level in order to obtain a prompt anamnestic response. The results of the tests of the prevaccination sera indicate that these subjects possessed little circulating antibody at that time. Thus from 3 to 5 years is too long an interval between booster doses of vaccine if it

is desired to keep the antibody at high levels. On the other hand, the response of these persons to a single dose of vaccine was excellent and compares favorably with the response of those who received a booster injection 9 months following the initial series (3). The post-vaccination serums in 54 of the 55 subjects showed a satisfactory antibody level indicating that once primary vaccination has been accomplished satisfactory antibody levels can be restored by the administration of a single dose of vaccine even if 4 or 5 years have elapsed since the last previous antigenic stimulation. The degree of response appears to be unrelated to the time elapsed since the last vaccination and to the number of doses previously received. The serum of those who previously had received only the initial series of 2 doses was titrated at the same levels as those who had been given 2 or 3 booster doses. There was some evidence that those subjects in whose pre-vaccination serum antibody could not be demonstrated by the complement-fixation technic were more prone to systemic reaction when vaccinated. The number of these was however too small for conclusive evaluation.

### CONCLUSION

If it should become necessary to recall veterans into service the level of their antibody against epidemic typhus could be satisfactorily restored by the administration of a single dose of epidemic typhus vaccine.

## THE WHITE HOUSE

W O N

May 8 1951

Dear Admiral McIntire

For the third time in thirty-four years, the life of this Nation is threatened by an aggressor. As our country makes the greatest defense effort any nation has been forced to attempt, the problem of manpower becomes basic. Manpower shortages, already felt in some quarters, will become increasingly acute as we speed our defense effort.

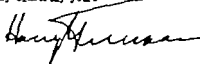
In our Nation, physically handicapped lie a vast reservoir of relatively untapped skills. These skills properly utilized, constitute a mighty bulwark against the present threat of manpower shortages. They must not be overlooked in our preparedness program. Qualified handicapped workers not now employed should be employed. Those not trained should be trained, screened for maximum usefulness and given the opportunity to contribute their skills and abilities.

The Congress has designated the first week in each October as National Employ the Physically Handicapped Week, time in which to all special attention to the need for increased employment of the handicapped. This need has never been more urgent.

As President of the United States, I call upon every American to provide greater opportunities for the employment and rehabilitation of the handicapped; not just during the observance of National Employ the Physically Handicapped Week, but during fifty-two weeks of the year. I earnestly ask that all informational and educational means be utilized to obtain the widest possible public understanding of this national program.

The manpower challenge that we face can be met. It must be met, if we are to survive as a Nation and preserve the peace of the world.

Very sincerely yours



Vice Admiral Ross T. McIntire  
(MC) CGM Retd.  
Chairman,  
The President's Committee on  
National Employ the Physically  
Handicapped Week  
U. S. Department of Labor  
Washington, D. C.

# Medical Problems of an Underwater Demolition Team<sup>(1)</sup>

Charles L. Waite, *Lieutenant, MC, U S N R.*

**A**S IN all highly specialized naval activities the officers and men assigned to an underwater demolition team face certain occupational hazards which are peculiar to their group. Our purpose in this article is to describe the medical aspects of these hazards and to suggest means for their prevention and treatment. The tactical function of an underwater demolition team is twofold (1) the preassault phase in which the team supports an armed landing force by reconnaissance of an enemy beach or harbor followed by destruction of natural and artificial obstacles which might impede the landing and (2) a postassault phase in which further clearing by demolition is carried out to facilitate the landing. In carrying out these activities the assigned personnel are required to spend many hours in and under the water doing heavy work under varying conditions of mental stress and are exposed to physical injury from pressure exposure underwater life and obstacles and enemy action.

## HAZARDS FROM PRESSURE

**Squeeze.** This accident involves the face of the underwater swimmer and is produced only when a face mask or goggles are being used and the air pressure within the face mask suddenly drops below that of the ambient pressure exerted by the water. This situation may result from the sudden failure of the air supply or from a sudden drop in depth by the swimmer as falling from a reef or ledge without an increase in the air supply to the mask. The relative negative pressure thus produced within the mask exerts its force on the eyes and skin of the face and if severe enough on the mucosa of the upper respiratory tract. A mild squeeze will cause tiny punctate hemorrhages to appear in the scleras and a more severe squeeze results in periorbital and facial edema and ecchymosis causing the eye and surrounding tissue to bulge outwardly. The severe form of this condition may result in death

(1) Experimental Diving Unit, U. S. Naval Gas Factory Washington, D. C.

or blindness and requires expert medical care. Another type of squeeze which affects the chest may occur if a skin dive (holding the breath) is made to a depth which is sufficient to compress the air in the lungs to a volume smaller than the residual air of the diver.

*Aero-otitis media* is caused by inequality in the pressure between the middle ear and the external ear which may result in hemorrhage and/or rupture of the ear drum. The eustachian tube must be patent for pressure equalization. The usual cause for blockage of this tube is an abnormal aggregation or edema of the lymphoid tissue about the nasopharyngeal end of the tube. More commonly an upper respiratory infection and more rarely a congenital abnormality may be the direct cause of the enlarged lymphoid tissue. The stretch placed on the drum results in a severe pain which usually prevents the swimmer from attaining a depth greater than 10 feet. When hemorrhage does occur the treatment is symptomatic and supportive and the ear must be kept absolutely dry until the hemorrhage has been absorbed. If the drum is ruptured, steps should be taken to prevent secondary infection. If the cause of the inability to equalize pressure in the middle ear is an abnormal amount of lymphoid tissue blocking the eustachian tube a series of radium treatments applied through the nasopharynx will usually clear it up. Every candidate for this type of training is given a test of 50 pounds of air pressure in a recompression chamber in order to determine his ability to equalize pressure.

*Compressed air illness* commonly called bends or caisson disease results from inadequate decompression following exposure to increased atmospheric pressure. Although the major portion of the swimming engaged in by demolition teams per se is on the surface or at shallow depths the possibility of compressed air illness should always be kept in mind. Two cases of compressed air illness which resulted from dives made at depths of less than 34 feet and of less than 45 minutes duration have recently been reported (2). Therefore compressed air illness should be considered in treating anyone doing moderate to heavy work under increased air pressures for any length of time. The most important point to remember is to treat all suspected cases according to the Standard U. S. Navy Treatment Tables as shown in chart 1.

*Air embolism* results from tearing of the lung tissue and the admission of large quantity of air into the blood stream. The ensuing embolism can cause asphyxia, convulsions and coma or paralysis and death. Personnel engaged in underwater demolition expose themselves to the possibility of air embolism when it becomes necessary to discard the face mask of an underwater breathing apparatus either because of flooding or mechanical failure and rise to the surface in the manner in which free escape is performed. If the air in the lungs is not

(2) Valtonen, V., and Vance, C. L.: Decompression sickness; report of two unusual cases. *Armed Forces Med. J.* 21: 1201-1205, Aug. 1951.

CHART 1. Treatment of caisson disease and air embolism

Scaps		Bends—pain only				Serious symptoms	
		Pain relieved at depths less than 66 ft.		Pain relieved at depths greater than 66 ft.		Serious symptoms include an on of the follow g	
Rate of descent—25 ft. per min.	Rate of ascent—1 minute between scaps.	Use tabl 1-A if oxygen is not availabl		Use tabl 2-A if oxygen is not availabl		1. Unconsciousness 2. Convulsions 3. V shock or inability to use mas or i ga. 4. Any visual disturbances. 5. Disorientation. 6. Loss of speech or hearing. 7. Severe shortness of breath	
		If pain does not improve within 30 min. at 165 ft. the sc is probably not bends. Decompress on tabl 2 or 2-A.		Symptoms relieved within 30 min. at 165 ft. Use tabl 3		Symptoms not relieved within 30 min. at 165 ft. U tabl 4	
Lb.	Ft.	Tabl 1	Tabl 1-A	Tabl 2	Tabl 2-A	Tabl 3	Tabl 4
73.4	165	—	—	30 (lr)	30 (air)	30 (air)	30 to 120 (air)
62.3	140	—	—	12 (air)	12 (air)	12 (air)	30 (air)
53.4	120	—	—	12 (air)	12 (air)	12 (air)	30 (air)
44.5	100	30 (air)	30 (air)	12 (air)	12 (air)	12 (air)	30 (air)
35.6	80	12 (air)	12 (air)	12 (air)	12 (air)	12 (air)	30 (air)
26.7	60	30 (O <sub>2</sub> ) <sup>a</sup>	30 (air)	30 (O <sub>2</sub> ) <sup>a</sup>	30 (air)	30 (O <sub>2</sub> or air)	6 hr (air)
22.3	50	30 (O <sub>2</sub> )	30 (air)	30 (O <sub>2</sub> )	30 (air)	30 (O <sub>2</sub> or air)	6 hr (air)
17.8	40	30 (O <sub>2</sub> )	30 (air)	30 (O <sub>2</sub> )	30 (air)	30 (O <sub>2</sub> or air)	6 hr (air)
13.4	30	5 (O <sub>2</sub> )	60 (air)	60 (O <sub>2</sub> )	2 hr. (air)	12 hr. (air)	First 11 hr. (air) Then 1 hr. (O <sub>2</sub> or air)
8.9	20		60 (air)	5 (O <sub>2</sub> )	2 hr. (air)	2 hr. (air)	First 1 hr. (air) Then 1 hr. (O <sub>2</sub> or air)
4.5	10		2 hr. (air)		4 hr. (air)	2 hr. (air)	First 1 hr. (air) Then 1 hr. (O <sub>2</sub> or air)
Surface		1 min. (air)		1 min. (air)		1 min. (air)	1 min. (O <sub>2</sub> )

Time at all steps is minutes unless otherwise indicated.

If symptoms occur while breathing air during treatment with any of the above table decompress to depth of relief line never l than depth of 30 ft. and then complete decompression from the depth according to tabl 4

<sup>a</sup>If dizziness, nausea, muscular twitching or blurring of vision occurs while breathing oxygen, remove mask and proceed as follows: (a) if using tabl 1, complete remaining steps of tabl 1-A; (b) if using tabl 2, complete remaining steps of tabl 2-A; (c) if using tabl 3, complete remaining steps of tabl 3 breathing air. At the discretion of the medical officer, oxygen breathing may be resumed at the 40 and 30 foot steps for total of 30 minutes if using table 1 or 3 and 150 minutes if using tabl 2.

RECOMMENDATIONS—Should symptoms occur following treatment with any of the above tables, recompress the diver to depth giving relief. If relief occurs at depths less than 30 feet take diver to 30 feet and decompress from 30 feet step to surface according to table 3. If relief occurs deeper than 30 feet, remain at the depth of relief line 30 minutes and then complete remaining steps of table 3 using air throughout.



permitted to escape rapidly enough or in sufficient quantity during the ascent, the resulting expansion causes tearing of the lung tissue with resultant embolism. Air embolism is always treated with recompression and the faster this is instituted the better. Proper training and a knowledge of the condition is the best method of preventing air embolism. Under combat conditions proper treatment will not be available and once an air embolism has occurred the man so affected will be unable to perform his duties.

*Oxygen poisoning* is a serious condition the exact mechanism of which is not known. If 100 percent oxygen is breathed at depths greater than 60 feet while resting or at depths over 30 feet while working oxygen poisoning may result. The early or warning symptoms are lip-itching, nausea, irritability, nerve pain similar to that of an electric shock, and visual and auditory aura. Convulsions and coma may ensue rapidly either after the warning symptoms or without their presence. Following the convulsions and coma is a state of mental confusion and at times a severe restlessness that borders on mania usually results. Oxygen poisoning is treated by the prompt cessation of the dive and the inhalation of fresh air. Prevention of bodily injury and drowning must be guarded against in the presence of convulsions. Biting or swallowing of the tongue may also occur. Limitation of the depth of the swimmer when pure oxygen is being used is the only sure method of prevention.

#### HAZARDS FROM USING UNDERWATER BREATHING APPARATUS

*Anoxia and carbon dioxide poisoning* occur as the result of mechanical failure of an underwater breathing apparatus or because of a mistake in operation made by the swimmer. Mechanical failure is usually caused by a severe leak in a supply line, a faulty valve or the use of an active carbon dioxide absorbent. The anoxia that occurs is of the noxious type and is sudden in onset. Carbon dioxide accumulation on the other hand gives the swimmer some warning symptoms such as burning of the faceplate, headache, nausea, dizziness, and weakness. The fogging of the faceplate is not a good indication of carbon dioxide retention because this occurs frequently when the swimmer is receiving an ample oxygen supply. The treatment of both conditions is the same: termination of the dive and plenty of fresh air. Oxygen, stimulant, and artificial respiration are required in the more serious cases especially when complicated by partial drowning.

Drowning usually occurs as a complication of noxious or carbon dioxide poisoning rather than as an entity. An injury sustained while working or swimming in heavy surf or severe muscular cramps may both disable the swimmer. Prompt treatment with and the administration of stimulants is

aided in his recovery by the use of pent  
small doses of serum thymon to absorb  
lungs.

## INJURIES FROM ENEMY ACTION

*Blast Injuries*

Probably no other group in the Navy is so routinely exposed to the hazards of an underwater explosion as are the personnel of an underwater demolition team. Severe injury and death can result from the effects of a blast following a nearby air or underwater explosion. The factors which determine the degree of injury sustained by personnel in the water are (1) proximity to the source of the blast (2) size and character of the explosive (3) the medium through which the force is transmitted (4) the degree of submersion of the diver and (5) the protection worn by the diver. All these factors are related in the production of the final effect of an explosion on a swimmer.

*Proximity and size of the explosion* are considered together because the total force exerted by a blast wave on a diver can be calculated from a formula which involves both. The pressure in pounds per square inch ( $P$ ) exerted by an underwater explosion of tetryl or TNT is expressed by the formula  $P = \frac{13000 \sqrt{W}}{d}$  in which  $W$  is the weight of

the explosive and  $d$  is the distance of the explosion from the diver (3). A sample calculation shows that a 600-lb charge at a distance of 50 feet exerts a pressure of 2 180 lb per square inch. A pressure of 500 lb is sufficient to cause injury to the lungs and intestinal tract; therefore one exerting 2 190 lb per square inch would invariably be fatal. There are two phases of an underwater blast: the compression wave which is the destructive factor and the disturbance caused by the expanding gases liberated by the explosion. This second wave has no destructive power. Another phenomenon observed in an underwater blast is the "shredding effect." When a compression wave reaches the surface of the water and exceeds a pressure of 500 lb per square inch, the surface of the water at a particular point will be literally shredded into narrow strips and blown upward as fingerlike projections of water. The solid organs (the liver, kidneys, and spleen) will be undamaged, but the organs that contain gas (the lungs and intestinal tract) will be shredded and perforated. Injury occurs by this mechanism, not by forcing of air or water down the throat or up the rectum. Therefore the practice of covering the rectum in anticipation of an underwater explosion is useless.

*Character of the explosion and the transmitting media.* Different explosives have different velocities of detonation or brisance. A highly brisant explosive produces its maximum pressure effect almost instantaneously, but this effect diminishes as rapidly as it was produced. An explosive with a lesser brisance will develop its maximum pressure more slowly, last longer, and therefore be more effective at a longer range provided the medium through which it is transmitted is re-

(3) Bureau of Naval Personnel, *Submarine Medicine Practical* (dd III of Military Medical Operation Courses), N vPers 10836, March 1949, pp. 49-57.

latively incompressible. When water is the transmitting medium, explosives of low brisance have a greater effective range for a longer period of time and thus cause a greater amount of injury. For the same amount of charge, waterborne blast pressures are of much less force than water-borne pressure.

*Degree of submersion.* In the event of an underwater explosion, the smaller the portion of the body submerged the better. If the head, chest and abdomen are below the surface all three could sustain sufficient damage to be fatal. A person who is swimming on his back or sid rather than on his abdomen has a better chance to survive. The shredding effect is minimized because of the greater thickness of tissue of the back. The best evasive tactics have to be decided for each operation. If air or surface blasts are anticipated, the best evasive tactic would be to swim deep. If underwater blasts are expected, then surface swimming on the back or side would be best. Protective clothing made from foam rubber or kapok have been shown to offer the maximum amount of protection for the minimum amount of weight. Future designing of swimming suits should include a protective lining of either of these materials around the chest and abdomen.

*Description of blast injuries.* Injury to the brain and central nervous system may occur if the head is submerged at the time of an underwater explosion. The chest and particularly the abdomen are the more common sites of injuries. Bruising and laceration of the skin are never seen following a submerged blast, even though the underlying organs may be severely damaged. In severe blast injuries laceration of the lungs and pleura will occur and extensive hemorrhage is present throughout the bronchi, bronchioles and alveoli. Intestinal perforation produces all the symptoms of an acute surgical condition of the abdomen. Prompt surgical repair and the use of antibiotics are important. The only skeletal injury ever reported from an underwater blast is that of a compression fracture of one or more of the lumbar vertebrae (3).

#### *Nuclear Radiation Hazards*

An area of water can become radiologically contaminated following an air surface or underwater burst of an atomic bomb. Contamination of water following an air burst is caused by the "fall-out" of radioactive particles, but most of the contamination following a surface or underwater burst is caused by direct radiation of the water. Because an enemy may render a beach radioactive by sowing radioactive material (fission products) at various landing points, personnel engaged in amphibious operations may encounter radiation hazard on land as well as in the water. Because the total roentgen dosage decreases rapidly, water is not usually as great a hazard as radioactive land. The factors which are responsible for this rapid decrease are natural decay, rapid dispersion of the total amount of radioactivity through a large area, and

the natural dilution of the water by currents and tides (4). This last factor will vary with the geographic location. Most of the radioactive particles in water will settle to the bottom in from 1 to 2 weeks following an underwater burst. In such a situation a swimmer should stay away from the bottom. The fact that radioactivity can be spread by marine life presents another problem. Seaweed, algae, and plankton absorb the radioactive salts from the water. These plants in turn are eaten by fish and other forms of marine life and thus a large area could be contaminated even though it was not exposed to the initial source of radiation. Preliminary reconnaissance of an area with radiation monitoring instruments and the use of small dosimeters by the personnel are the only satisfactory preventive measures which can be offered at this time.

### EXPOSURE HAZARDS

Water temperatures below 60°F will seriously limit the time that can be spent in the water as well as the operating effectiveness of the personnel. Chilling and fatigue may predispose to infections of the upper respiratory tract. Colds, sinusitis, and middle ear infections are common among personnel engaged in underwater demolition and at times are definitely prolonged or made worse by further swimming. This is true whether the water is cold or warm. It should be a rule, particularly during training periods, that personnel afflicted with upper respiratory infections stay out of the water until well on the way to recovery because the time thus lost is less than that lost because of a complicated infection or a relapse brought on by attempts to shorten the convalescence. This method is recommended to keep the maximum number of men in operational readiness for the greatest number of days. Following exposure to a chilling environment, hot soup or coffee are excellent body warming measures and may aid in preventing a respiratory infection.

Sunburn may result from uncontrolled exposure to the sun. The health and efficiency of personnel are seriously affected by this. If the time is available, a daily schedule of gradual exposure should be arranged. An hour a day is used at first with a gradual increase each day. If time is lacking for the gradual method, protective clothing and sunburn protective ointment should be used, particularly on the shoulders, back, nose, and face. Zinc oxide can be used in place of the standard protective ointment. The present protective ointment should be modified for use by the demolition teams because the brilliant white color is a detection risk and prevents its use in actual operations.

### MISCELLANEOUS UNDERWATER HAZARDS

*Fungus infections* are common among personnel engaged in underwater demolition, particularly those operating in a warm, moist climate.

(4) Th. U. S. Atomic Energy Commission and Th. U. S. Department of Defense: *The Effects of Atomic Weapons*. Prepared under the direction of Th. L. Alamos Scientific Laboratory, Los Alamos, N. M., Jan. 1950. p. 282.

by picking them off with a towel or any other piece of cloth and washing the area with fresh water and the application of an analgesic ointment. The use of epinephrine or an antihistaminic drug will allay the pruritus and urticaria. A severe secondary reaction of rapid onset is sometimes seen following nettle sting. Pallor, sweating, muscular cramps, faintness, shortness of breath, thready pulse and a fall in blood pressure are indicative of anaphylactic shock and emergency treatment with epinephrine given intravenously or benadryl should be administered. If angioneurotic edema appears the air passageways should be cleared, oxygen administered and tracheotomy performed if necessary. There have been no authenticated medical reports of death as a result of a Portuguese-man-of-war sting although it may occur if complicated by anaphylactic shock.

### PSYCHOLOGIC ASPECTS AND THE SELECTION OF PERSONNEL

To give a man who swims, pairs of swim fins and a face mask does not produce an underwater demolition team member. The physical hardships and mental strain make this duty suitable only for carefully selected personnel. As in the submarine service and with deep sea divers the candidate must be a volunteer. A careful investigation of the factors of motivation should be made in order to screen out those who attempt to avoid certain duty because they dislike it. The candidate must also realize the type of duty for which he has volunteered. The reconnaissance work requires the candidate to possess above average intelligence and to be resourceful and capable of working alone. He must be team-conscious, cooperative and fit in with the group. Claustrophobia of which there is a high incidence among the candidates may become evident during the first underwater experience or may not develop until after repeated exercises. To overcome this fear confidence in one's own ability and in the equipment is necessary. The candidate may frankly admit his claustrophobia. If he does it is simple to eliminate him from the team but when he fails to admit his fear the problem becomes complicated. The first evidence may be loss of working efficiency or psychosomatic complaints such as easy fatigue, shortness of breath and numerous aches and pains. The medical officer must rule out actual illness before entertaining a psychosomatic diagnosis. Effective psychological screening of personnel can only be accomplished by the personal interview technique. Written questionnaires can be answered in a fashion to determine that the candidate is psychologically fit whereas in an interview with the medical officer the questioning can be guided along lines which may reveal neuropsychiatric traits. At the same time an appraisal of the manner of response may be made.

# Needle Biopsy of the Liver

Otto A. Wurl, *Lieutenant Colonel MC, U S A.* (1)

John H Moyer *M. D.* (2)

**I**N RECENT years interest in needle biopsy of the liver as a diagnostic adjunct to the clinical and laboratory examination of the patient with hepatic or suspected hepatic disease has been increasing. This interest has been caused in large part by the renewed impetus given this technic by Roholm and Iversen (3) and by Dible et al. (4) in the study of the pathology of epidemic and serum hepatitis. That this approach to a better understanding of liver disease is not new has been pointed out by Hoffbauer (5). The series of 81 biopsies herein reported thus represents but a small contribution to the gradually increasing number now being performed throughout the world.

Needle biopsy of the liver was begun at this hospital by one of us (J H M) in late 1946. Originally the subcostal approach, first recommended by Baron (6) and subsequently used by Tripoli and Fader (7) was employed, using the Vim Silverman needle. This technic was employed only in the presence of a definitely palpable liver as advocated by Hoffbauer et al. (8). In early 1947 after study on cadavers the intercostal approach was adopted. This change was prompted by a desire to avoid the hazard of perforating the gallbladder or other hollow viscera and to extend the technic in the elucidation of liver disorders not accompanied by hepatomegaly. This intercostal technic has proved

(1) Brooke Army Hospital, Fort Sam Houston, Tex.

(2) Department of Medicine, Baylor University College of Medicine, Houston, Tex.

(3) Roholm, K. and Iversen, P.: Change in liver in acute epidemic hepatitis (catarrhal jaundice) based on 38 aspiration biopsies. *Acta path. et microbiol. Scandinav.* 16: 427-442, 1939. *betr. Leberveränderungen bei akuter epidem. cher Hepatitis. V. handl. d. deutsch. Ges. Inn. f. inn. Med., Kong.* 51, pp. 359-361, 1939.

(4) Dible J H.; McMichael, J., and Sherlock, S. P. V.: Pathology of acute hepatitis; aspiration biopsy studies of epidemic arsenotherapy and serum jaundice. *Lancet* 2: 402-408, Oct. 2, 1943.

(5) Hoffbauer F W.: Needle biopsy of liver. *J. A. M. A.* 134: 666-670, June 21, 1947.

(6) Baron, E.: Aspiration for removal of biopsy material from liver; report of 35 cases. *Arch. Int. Med.* 63: 276-289, Feb. 1939.

(7) Tripoli, C. J., and Fader, D. E.: Differential diagnosis of certain diseases of liver by means of punch biopsy. *Am. J. Clin. Path.* 11: 516-527, June 1941.

(8) Hoffbauer F W., Evans, G. T., and Wooten, C. J.: Cirrhosis of liver with particular reference to correlation of composite liver function studies with liver biopsy. *M. Clin. North America* 29: 363-388, Mar. 1945.

to be so satisfactory that the subcostal approach has been abandoned even in the presence of gross liver enlargement.

### TECHNIC

The patient must be conscious, alert, and cooperative. The bleeding, clotting, and prothrombin times must be within normal range: a value of 25 seconds as compared to a control of 20 seconds is regarded as the upper limit for the prothrombin time. Blood typing and cross-matching are done. Preoperative medication consists of from 0.1 to 0.2 gram of pentobarbital sodium 1 hour before the procedure. The biopsy is performed with the patient in the supine position with his head supported by one pillow. He lies on the right side of the bed with his right arm extended over his head in order to widen the intercostal spaces. The site of insertion of the needle is chosen at the inferior margin of the costophrenic sinus at the attachment of the diaphragm, in the anterior or midaxillary line. This site is ordinarily on a level with a point about 3 cm. below the xyphoid process of the sternum and in the eighth intercostal space. The desired site is that opposite the thickest part of the right lobe of the liver, above and lateral to the gallbladder. The skin is prepared with tincture of mercuric iodine. One percent procaine is liberally injected into the interspace anesthetizing down to the parietal pleura. A 1/8-inch incision is made in the skin at the site of the injection of the biopsy needle. The patient is instructed to inspire deeply and exhale completely 4 or 5 times, finally holding the breath in complete expiration. The biopsy is then secured in the usual manner and the core of tissue is immediately placed in 10 percent formalin, Zenker's fluid, or Bouin's fluid. The securing of the tissue requires about 10 seconds from the time of insertion of the trocar until withdrawal of the two needles and specimen. Postoperative pain has been minimal and readily controlled by one or two doses of codeine. The patient is frequently observed for bleeding in the first 3 hours after the procedure; during this period he is cautioned to remain quietly in bed. For the next 24 hours he is permitted bathroom privileges only and after 24 hours there is no restriction of activity.

The possibility of hemorrhage from the liver incident to laceration because of fixation of the needle in the intercostal space has been mentioned (6, 8). As a safeguard, the patient is instructed to hold his breath in expiration until completion of the procedure.

### CLINICAL MATERIAL

This report comprises 81 biopsies performed on 81 patients that were admitted to the wards of this hospital between November 1946 and November 1948. Seventy-nine of the patients were men and 2 were women. Their ages ranged from 18 to 76 years. For purposes of study these patients were categorized in 7 different groups by their clinical diagnosis: Group I, 31 with portal cirrhosis; Group II, 2 with acute hepatitis; Group III, 10 with chronic hepatitis; Group IV, 10 with hepatomegaly of undetermined cause; Group V, 5 with congestive hepatomegaly; Group VI, 7 with miscellaneous clinical diagnoses; and Group VII, 16

with no evidence of liver disease who served as controls. Tables 1 and 2 summarize the pertinent clinical and laboratory findings.

### USE OF TERMS

The adequacy of each patient's diet was determined insofar as possible. Good implies a generally well-balanced diet with respect to carbohydrate, protein, fat, vitamin and mineral content. The regular ingestion of meat, milk, and eggs was particularly inquired about and the patient's eating habits were observed on the ward. Fair indicates a diet that was less than adequate, usually deficient in protein and calories. A diet frankly deficient both quantitatively and qualitatively was listed as poor and is typified by the diet of many patients with chronic alcoholism who habitually stop eating during bouts of drinking. Alcohol intake was listed as mild for the social drinker and moderate for those falling between the social drinker and the chronic alcoholic. The degree of hepatomegaly and splenomegaly is expressed as the palpability of the liver in centimeters below the costal margin in full inspiration. Spider angiomas were frequently noted, but their occurrence was omitted from the clinical synopsis.

Under "histopathologic diagnosis" (1) *portal cirrhosis* included those specimens which on microscopic section demonstrated definite derangement of normal lobular architecture, portal area fibrosis and round cell infiltration; in addition bile duct proliferation was usually evident, and signs of hepatic cell regeneration were frequently seen in a few instances, fatty infiltration of hepatic cells was noted, (2) *fatty metamorphosis* was classified as mild, moderate or marked, depending on the degree of fatty vacuolization; in none of these were there sufficient histologic criteria for rendering an unequivocal microscopic diagnosis of portal cirrhosis; (3) *acute hepatitis* was diagnosed when definite evidence of hepatic cell necrosis and marked inflammatory cellular infiltration were present; and (4) *cholangitis* was diagnosed if an abnormal infiltration of inflammatory cells, usually lymphocytes and plasma cells into the portal areas with or without a minimal portal area fibrosis but with no significant disturbance in lobular architecture was present.

Of the laboratory procedures, (1) *bromsulphalein retention* was measured at the end of 45 minutes after the injection of 5 mg. of dye per kg. of body weight; (2) *thymol turbidity* was expressed in units according to the technic of Shank and Hoagland (9) for this laboratory 6.5 units is probably the upper limit of normal and (3) *glucose tolerance* was expressed as mildly, moderately or markedly decreased if the blood sugar at the end of the second hour was over 120 mg. per 100 cc. but less than 200 mg., over 200 mg. but less than 300 mg. and over 300 mg. per 100 cc. of blood respectively; a flat curve did not exceed 140 mg. in any specimen. Only the standard oral glucose tolerance test was employed.

(9) Shank, R. E. and Hoagland, C. L.: Modified method for quantitative determination of thymol turbidity reaction of serum. J. Biol. Chem. 162: 133-138, J. N. 1946.



TABLE 1. *Summary of clinical findings*

## Clinical data

Patient	Age (years)	Diet	Alcohol intake	Hepato- megaly (cm.)	Jaundice	History of jaundice	Miscellaneous
<i>Group I</i>							
1	54	Good	None	6	No	No	Ascites; edema; splenomegaly 4 cm.
2	52	Poor	Marked	10	Yes	Recurrent for 5 yr.	Ascites; splenomegaly 3 cm.
3	51	Poor	Marked	10	No	No	
4	45	Good	Marked	6	No	No	
5	55	Good	Moderate	6	Yes	1946	
6	68	Good	None	10	No	No	Ascites; edema
7	53	Good	None	0	Yes	No	Ascites; edema
8	53	Good	Moderate	4	Yes	1946	Splenomegaly 6 cm.
9	42	Poor	Unknown	5	No	1942	
10	48	Good	None	4	Y	No	
11	49	Good	Moderate	0	No	No	Ascites; edema; splenomegaly 3 cm.
12	47	Poor	Marked	5	No	No	Ascites; edema; splenomegaly 4 cm.
13	63	Poor	Marked	0	Yes	Unknown	
14	63	Poor	Marked	8	No	Unknown	
15	53	Fair	Marked	4	Yes	No	
16	58	Fair	Marked	4	No	No	
17	61	Good	Moderate	7	No	No	
18	44	Poor	Marked	5	No	No	
19	46	Fair	Marked	4	Yes	No	
20	54	Poor	Marked	8	No	1946	Ascites
21	46	Poor	Marked	3	No	No	
22	52	Fair	Marked	6	No	No	
23	44	Good	Moderate	5	No	No	
24	30	Good	Moderate	5	No	No	
25	32	Poor	Marked	5	No	No	
26	57	Fair	Moderate	5	No	No	Ascites; edema
27	42	Good	Moderate	5	No	No	
28	42	Good	Moderate	2	No	No	
29	51	Fair	Marked	4	No	No	
30	39	Good	Marked	0	No	1933	
31	52	Good	Marked	5	No	No	
<i>Group II</i>							
32	28	Good	None	6	Yes	No	
33	24	Good	None	10	Yes	No	Edema; lymphadenopathy
<i>Group III</i>							
34	51	—	None	2	No	1944	Presence of J pattern for 3 yr.

TABLE 1. *Summary of clinical findings—Continued*

Patient	Age (years)	Clinical data					Miscellaneous
		Diet	Alcohol intake	Hepatomegaly (cm.)	Jaundice	History of jaundice	
35	32	—	Non	0	No	1945	Prisoner of Japanese for 2½ yr
36	52	Good	None	2	No	1942	Tenderness in right upper abdominal quadrant
37	47	Good	Mild	1	No	1942	Tenderness in right upper abdominal quadrant
38	29	Good	Mild	1	No	1946	Tenderness in right upper abdominal quadrant
39	21	Good	None	0	No	1945	Tenderness in right upper abdominal quadrant
40	23	Good	None	3	No	9 mo earlier	
41	28	—	Moderate	0	N	1945	Prisoner of Japanese for 3 yr.
42	42	Good	Non	0	No	1942	Essential hypertension Moderate anemia Convalescing from viral pneumonia 3 wk. earlier
43	26	Good	Mild	2	No	1943	
44	55	Poor	Moderate	6	No	N	
45	68	Good	Moderate	5	No	No	
46	56	Good	Non	10	No	No	
47	35	Good	Moderate	6	No	No	Active far-advanced pulmonary tuberculosis Prisoner of Japanese for 3 yr.
48	54	Fair	Moderate	4	No	N	
49	55	Fair	Moderate	6	No	No	
50	51	Good	Non	10	N	N	
51	22	—	Moderate	4	No	No	Splenomegaly 4 cm. Active far-advanced pulmonary tuberculosis
52	54	Poor	None	4	N	No	Obese
53	32	Good	Mild	6	No	No	

TABLE 1. *Summary of clinical findings*—Continued

Patient	Age (years)	Clinical data					Miscellaneous
		Diet	Alcohol intake	Hepato-megaly (cm.)	J. indices	History of disease	
Group V							
54	54	Good	Marked	10	No	No	Intermittent congestive heart failure for 2 yr.
55	49	Good	None	6	No	No	Edema; congestive heart failure for 2 mo.
56	46	Good	None	6	No	No	Edema; intermittent congestive heart failure for 2 yr.
57	56	Good	Moderate	10	No	No	Ascites; edema; intermittent congestive heart failure for 2 yr.
58	51	Fair	None	10	No	N	Edema; congestive heart failure for 2 mo.
Group VI							
59	76	Poor	None	1	No	No	Pellagra-like lesions on hands; pruritus of lower extremities
60	57	Fair	Marked	0	No	N	Splenomegaly 5 cm.
61	75	Good	None	3	No	No	
62	20	Good	None	0	Y	6 mo. duration	
63	43	Good	None	5	No	No	Obesity
64	45	Good	None	0	No	No	
65	64	Good	Moderate	0	No	No	
Group VII							
66	23	Good	Moderate	0	No	N	Complete situs inversus
67	25	Good	None	0	No	No	
68	37	Good	None	0	N	No	
69	51	Good	None	0	N	No	
70	18	Good	None	0	No	No	
71	19	Good	None	0	No	N	
72	25	Good	None	0	N	1947	
73	53	Good	None	0	No	No	
74	22	Good	None	0	No	No	
75	41	Good	None	0	No	No	
76	22	Good	None	0	No	1946	
77	42	Good	Mild	0	No	No	
78	57	Fair	None	2	No	No	
79	56	Good	Moderate	2	N	No	
80	44	Good	None	3	No	No	
81	27	Good	None	0	No	No	Active minimal pulmonary tuberculosis

TABLE 2. Summary of diagnoses and laboratory procedures

Patient	Diagnosis		Laboratory procedures				
	Clinical	Histopathologic	Serum protein	Bromsulphalein	Thymol turbidity	Icterus index	Glucose tolerance
Group I							
1	Portal cirrhosis; diabetes mellitus	Unsatisfactory specimen	7(2.9/4.1)	22	—	12	Markedly decreased
2	Portal cirrhosis	Unsatisfactory specimen	7(4/3)	14	—	20	Flattened curve
3	Portal cirrhosis	Unsatisfactory specimen	7.5(5/2.5)	10	—	8	Normal
4	Portal cirrhosis	Unsatisfactory specimen	—	—	—	—	Mildly decreased
5	Portal cirrhosis	Unsatisfactory specimen	6.8(5/1.8)	24	—	42	Moderately decreased
6	Portal cirrhosis	Portal cirrhosis	6.7	34	2.5	9	Mildly decreased
7	Portal cirrhosis	Portal cirrhosis	5.3	16	22	30	—
8	Portal cirrhosis	Portal cirrhosis	6.3	12	12.5	24	Mildly decreased
9	Portal cirrhosis	Portal cirrhosis	7.2(4.7/2.5)	2	—	3	Mildly decreased
10	Portal cirrhosis	Portal cirrhosis	7.8(4.2/3.6)	23	3.5	16	Mildly decreased
11	Portal cirrhosis	Portal cirrhosis	7.3(4.4/2.9)	—	25	10	—
12	Portal cirrhosis	Portal cirrhosis	7.6(5.4/2.2)	14	9.5	12	Moderately decreased
13	Portal cirrhosis	Portal cirrhosis	8.8	—	—	—	—
14	Portal cirrhosis	Portal cirrhosis	6.9	17	1.5	—	Mildly decreased
15	Portal cirrhosis	Portal cirrhosis	6.3(2.1/4.2)	26	15.5	52	Moderately decreased
16	Portal cirrhosis; diabetes mellitus	Portal cirrhosis	8.6(3.5/5.1)	17	60	4	Markedly decreased
17	Portal cirrhosis	Portal cirrhosis	8.2(5.1/3.1)	17	2	8	—
18	Portal cirrhosis; diabetes mellitus	Portal cirrhosis	7.7(5.2/2.5)	21	7.2	6	Markedly decreased
19	Portal cirrhosis	Portal cirrhosis	7	24	3.8	24	Normal
20	Portal cirrhosis	Portal cirrhosis	7.8(5.3/2.5)	29	0	12	Mildly decreased
21	Portal cirrhosis	Portal cirrhosis	7.8(5.2/2.6)	1	11	4	Mildly decreased
22	Portal cirrhosis	Portal cirrhosis	7(4.3/2.7)	2	8.6	4	—
23	Portal cirrhosis	Portal cirrhosis	7.8(3.9/3.9)	16	6.9	4	—
24	Portal cirrhosis	Portal cirrhosis	—	22	20	8	—

TABLE 2. *Summary of diagnoses and laboratory procedures—Continued*

Patient	Diagnosis		Laboratory procedures				
	Clinical	Histopathologic	Serum proteins	Bromsulphalein	Thymol turbidity	Icterus index	Glucose tolerance
25	Portal cirrhosis	Fatty metamorphosis, marked	7.4(5.5/1.9)	29	3.5	2	Mildly decreased
26	Portal cirrhosis	Fatty metamorphosis, marked	7.7(5.2/2.7)	15	2	3	—
27	Portal cirrhosis	Fatty metamorphosis, mild	7.5(4.8/2.7)	3	3	6	Mildly decreased
28	Portal cirrhosis	Fatty metamorphosis, marked	8.2(6.2/2)	33	6	4	Mildly decreased
29	Portal cirrhosis	Fatty metamorphosis, moderate	7(4.5/2.5)	10	2.4	4	—
30	Portal cirrhosis	Fatty metamorphosis, marked	5.5(3.3/2.2)	10	1	1	—
31	Portal cirrhosis	Fatty metamorphosis, moderate	7.5(5.5/2)	—	3	9	Mildly decreased
<b>Group II</b>							
32	Serum hepatitis	Hepatitis cuts	7.5(4.9/2.6)	41	16	45	Normal
33	Syphilitic hepatitis	Hepatitis, acute negative Warthin-Starry stain for spirochetes	8.1(4.2/3.9)	41	13.5	36	—
<b>Group III</b>							
34	Chronic hepatitis	Normal liver	7(4/3)	—	6	4	—
35	Chronic hepatitis	Diffuse hepatitis and cholangitis	7.5(5.5/2)	12	7	4	—
36	Chronic hepatitis	Normal liver	6.5(5.5/1)	9	8	4	Markedly decreased
37	Chronic hepatitis	Normal liver	7.5(5/2.5)	1	17	6	Mildly decreased
38	Chronic hepatitis	Normal liver	9.1(5.8/3.3)	20	5	16	Flat curve
39	Chronic hepatitis	Normal liver	—	—	0	—	—
40	Chronic hepatitis	Chronic cholangitis, mild	8.2(5.1/3.0)	1	5	4	Normal
41	Chronic hepatitis	Chronic cholangitis, mild	7.4(5.2/2.2)	1	9	6	Normal
42	Chronic hepatitis	Normal liver	7.2(4.4/2.8)	—	0	4	Normal

TABLE 2. Summary of diagnoses and laboratory procedures—Continued

Patient	Diagnosis		Laboratory procedures				
	Clinical	Histopathologic	Serum proteins	Bromsulphalein	Thymol turbidity	Icterus index	Glucose tolerance
43	Chronic hepatitis	Chronic cholangitis mild	7.5(5.2/2.3)	4	10	4	Mildly decreased
Group IV							
44	Hepatomegaly cause undetermined, portal cirrhosis	Fatty metamorphosis marked	6.7(4.6/2.1)	14	1	4	—
45	Hepatomegaly cause undetermined	Normal liver	7.4(4.8/2.6)	2	1.5	4	Normal
46	Hepatomegaly cause undetermined	Normal liver	7	3	—	8	Normal
47	Hepatomegaly cause undetermined	Normal liver	7.8(4.3/8)	0	6	3	Normal
48	Hepatomegaly cause undetermined	Chronic cholangitis, mild	7.2(4.1/3.1)	2	16.4	4	Normal
49	Hepatomegaly cause undetermined; possible cholecystitis	Normal liver	7.2(4.6/2.6)	—	3	10	—
50	Hepatomegaly cause undetermined	Normal liver	7.5(3.8/3.7)	5	7.6	4	—
51	Hepatomegaly cause undetermined	Chronic cholangitis, mild	6.2(3.4/2.8)	3	7.5	4	Flat curve
52	Hepatomegaly cause undetermined	Normal liver	7.3(3.8/3.5)	7	8	4	—
53	Hepatomegaly cause undetermined	Fatty metamorphosis marked; chronic cholangitis	—	9	3.4	4	Normal
Group V							
54	Congestive hepatomegaly	Normal liver	7.8(5/2.1)	18	4	4	Mildly decreased
55	Congestive hepatomegaly	Fatty metamorphosis, mild	8.2(4.8/3.4)	25	15	8	Normal
56	Congestive hepatomegaly	Normal liver	6.7(4.4/2.3)	29	4	4	Mildly decreased
57	Congestive hepatomegaly	Normal liver	7.2	30	3	6	Flat curve
58	Congestive hepatomegaly	Fatty metamorphosis, mild	7	12	—	4	—

TABLE 2. *Summary of diagnosis and laboratory procedures—Continued*

Patient	Diagnosis		Laboratory procedure				
	Clinical	Histopathologic	Serum proteins	Bromsulphalein	Thymol turbidity	Icterus index	Glucose tolerance
<b>Group VI</b>							
59	Malnutrition (pellagra?)	Normal liver	7.5(4.1/3.4)	2	42	4	—
60	Chronic alcoholism	Normal liver	7.4(5.1/2.5)	4	1	4	Mildly decreased
61	Modigliani disease	Normal liver	—	—	—	4	—
62	Benign regression jaundice or chronic hepatitis	Normal liver	8(5/3)	26	1.7	24	—
63	Diabetes mellitus	Normal liver	—	2	—	—	Markedly decreased
64	Obesity	Fatty metamorphosis, mild	7.7(4.8/2.9)	8	8	4	Markedly decreased
65	Peptic ulcer	Normal liver	—	2	3.4	—	—
<b>Group VII</b>							
66	Control	Normal liver	7.3	4	6.6	6	—
67	Control	Normal liver	7.5(4.5/3)	2	4.4	6	—
68	Control	Normal liver	—	—	—	—	—
69	Control	Normal liver	—	—	—	—	—
70	Control	Normal liver	7.8(4.8/3)	—	4.2	6	—
71	Control	Normal liver	—	—	—	—	—
72	Control	Normal liver	6.8(4.8/2)	2	6.2	3	—
73	Control	Normal liver	7.5(4.3/3.5)	4	6.9	3	—
74	Control	Normal liver	7.5(5.2/2.3)	1	4	4	—
75	Control	Normal liver	8.2(5.1/3.1)	4	1.5	4	Normal
76	Control	Normal liver	7.7(5.2/2.5)	1	2	4	Normal
77	Control	Normal liver	7(4.9/2.1)	2	4.6	4	—
78	Control	Normal liver	8(5.6/2.4)	1	3.5	4	—
79	Control	Normal liver	7.5(5.2/2.3)	0	—	4	Normal
80	Control	Normal liver	7(5/2)	2	6.5	4	Normal
81	Control	Cholangitis, mild	9(3.2/3.8)	1	—	3	—

## CORRELATION OF CLINICAL AND HISTOPATHOLOGIC DIAGNOSES

**Group I Portal cirrhosis** In 19 cases the histologic diagnosis unequivocally substantiated the clinical impression. Of the remaining 7 cases of clinically diagnosed portal cirrhosis on whom satisfactory specimen were obtained, fatty metamorphosis in some degree was observed. This finding in conjunction with the clinical and laboratory

data in each case was believed to afford sufficient evidence of early portal cirrhosis (10-14).

*Group II. Acute hepatitis.* The two cases of acute hepatitis were substantiated histopathologically although their exact cause was not established. The case of serum hepatitis could not be differentiated from infectious hepatitis histopathologically but a history of multiple blood transfusions 93 days prior to the onset of jaundice strongly suggested the etiologic basis.

*Group III Chronic hepatitis.* Of this group 6 showed no abnormality of the specimen obtained by biopsy and 3 were regarded as demonstrating a mild chronic cholangitis. The tenth case showed a diffuse infiltration of inflammatory cells as well as portal area infiltration. All gave a history of previous jaundice varying from 9 months to 5 years prior to the present study. None were clinically jaundiced during the period of observation although 1 had an elevated icterus index. Of the 6 patients demonstrating no abnormality of the biopsy specimen 3 showed one or more abnormality of liver function. The difficulties of reaching an accurate diagnosis in the absence of liver biopsy in patients presenting vague symptoms following infectious hepatitis have been stressed by Volwiler and Elliott (15).

*Group IV Hepatomegaly of undetermined cause.* A liver edge palpable 4 cm or more below the right costal margin on full inspiration was arbitrarily regarded as abnormally accessible and in the absence of obvious factors (e. g. pulmonary emphysema) tending to depress the organ lower into the abdominal cavity the liver was presumed to be enlarged. That such accessibility is not necessarily indicative of pathologic changes in the liver was demonstrated by normal histologic specimens in 6 patients in this group. Of those 4 patients in whom abnormal histopathologic findings were obtained, all were aided by the procedure. In one a diagnosis of early portal cirrhosis (hypertrophic fatty stage) was established, in one the existence of a chronic cholangitis was ascertained, in one an unsuspected low grade cholangitis was found, and in one a moderate cholangitis and a marked fatty metamorphosis were detected.

(10) Connor, C. L.: Etiology and pathogenesis of alcoholic cirrhosis of liver. *J. A. M. A.* 112: 387-390, Feb. 4, 1939.

(11) Hall, E. M., and Morgan, W. A.: Progressive alcoholic cirrhosis, clinical and pathologic study of 68 cases. *Arch. Path.* 27: 672-690, Apr. 1939.

(12) Kikabauim, J. D., and Shure, N.: Alcoholic cirrhosis of liver; clinical and pathologic study of 336 fatal cases selected from 12,267 necropsies. *J. Lab. & Clin. Med.* 28: 721-731, Mar. 1943.

(13) Gillman, J., and Gillman, T.: Structure of liver in pellagra. *Arch. Path.* 40: 239-263, Oct. 1945.

(14) Moschcowitz, E.: Laennec cirrhosis; its histogenesis with special reference to role of aglogenesis. *Arch. Path.* 45: 187-215, Feb. 1948.

(15) Volwiler, W., and Elliott, J. A., Jr.: Late manifestations of epidemic infectious hepatitis. *Gastroenterol.* 10: 349-363, Mar. 1948.



*Group V Congestive hepatomegaly* The desire to know whether these cases demonstrated any of the histologic features of cardiac cirrhosis prompted their inclusion in this series. None showed sufficient histopathologic criteria for a diagnosis of cardiac cirrhosis but all exhibited significant retention of bromsulphalein dye.

*Group VI Miscellaneous diagnoses* In view of the work of Gillman and Gillman (13) on the development of fatty liver and pigmentary cirrhosis in pellagrins, the finding of normal liver tissue in case 59 was mildly surprising. Possibly it was because of the relatively short duration (1 year) of the patient's dietary inadequacy. Case 60 with marked chronic alcoholism likewise had normal tissue. Such a finding was consistent, however, with the generally accepted belief that dietary factors, not alcohol, are of etiologic importance. Liver biopsy failed to demonstrate the characteristic findings of Hodgkin's disease in case 61. Case 62 gave no family history of jaundice and demonstrated no anemia or evidence of hemolysis. The serum bilirubin was of the indirect type. The differential diagnosis was between chronic hepatitis and benign retention jaundice (constitutional hepatic dysfunction). The persistent indirect serum bilirubinemia and normal thymol turbidity test favored the latter diagnosis (16, 17). The abnormal bromsulphalein retention, however, and the history of dark urine at the time of first recognition of the jaundice by the patient tended to support the diagnosis of hepatitis. The normal liver biopsy obtained on this patient, however, would seem to favor constitutional dysfunction of the liver (18).

*Group VII Controls.* This group comprised 16 patients who had been admitted to the hospital for illnesses other than that of the liver or biliary tract. The majority were convalescent and ready for discharge at the time the biopsy was obtained. Two gave a history of infectious hepatitis. Only one exhibited abnormal liver tissue, and this was of questionable significance.

#### CLINICAL OBSERVATIONS OF 27 CASES OF PORTAL CIRRHOSIS CONFIRMED BY LIVER BIOPSY

There were 27 patients in whom the clinical and tissue diagnosis was portal cirrhosis and 8 with fatty metamorphosis. All were male.

*Age.* Their average age was 50 years (range 30 to 68).

*Diet.* Twelve gave a history of having taken a good diet, 6 were adjudged to have been only fair and 9 poor.

(16) Dameshek, W. and Sager, E. Familial nonhemolytic jaundice; constitutional hepatic dysfunction with indirect van den Bergh reaction. Arch. Int. Med. 67: 259-285, Feb. 1941.

(17) Comfort, M. W. and Haynes, R. M. Constitutional hepatic dysfunction; clinical study of 35 cases. Gastroenterology 3: 155-162, Sept. 1944.

(18) Knap, N. B. and Rehalm, K. Leberbiopsie bei Icterus internus juvenilis. Histologische Untersuchungen. Klin. Wochenschr. 20: 193-196, Feb. 22, 1941.

**Alcoholism.** Twenty-three gave a history of significant alcoholism. Of these 14 were "marked" and 9 were moderate. There were 3 who, so far as could be ascertained, had never taken significant amounts of alcohol and the habits of 1 were not stated. The incidence of moderate to marked alcoholism in this group of patients thus amounted to 85 percent, an incidence commensurate with that reported by others (19-21).

**Antecedent history of jaundice.** Four of the 27 patients gave an antecedent history of jaundice. 1 patient having had 2 episodes. Twenty-one denied having been jaundiced prior to their current hospitalization and in 2 its presence or absence in the past history was not stated. These findings though statistically of doubtful significance indicate that only about 15 percent of this group could be related etiologically to a pre-existing clinical infectious hepatitis. Further doubt is cast by the fact that in 2 of these 4 patients the history of antecedent jaundice was less than a year prior to their biopsy.

**Hepatomegaly splenomegaly and ascites.** Of the 27 patients with cirrhosis 23 had palpable livers. In 19 the liver edge could be felt 4 cm. or more below the right costal margin on full inspiration. This finding, confirming the observations of numerous investigators (19, 20, 22-26) casts doubt on the accuracy of the term *atrophic cirrhosis* although in the end stages of the disease the liver may indeed be greatly scarred and shrunken. In only 3 patients could the spleen be palpated. This finding is somewhat at variance with those of the above-cited observers and is probably caused by a portal vein hypertension of a degree insufficient to produce a palpable congestive splenomegaly. The fact that only 6 patients demonstrated clinically detectable ascites favors this explanation.

**Jaundice.** Six of the patients exhibited clinical jaundice during the observation period. Three others had icterus indexes of 10 or more making a total of 9 patients, or 33 percent presenting clinical or sub-

(19) Gotardo, P., and Winters, W. L.: Portal cirrhosis: Correlation of clinical, laboratory, peritoneoscopic and autopsy findings. *Am. J. M. Sc.* 204: 205-217, Aug. 1942.

(20) Fagin, L. D., and Thompson, F. M.: Cirrhosis of liver: analysis of 71 cases. *Ann. Int. Med.* 21: 285-297, Aug. 1944.

(21) Boles, R. S., Crew, R. S., and Dunbar, W.: Alcoholic cirrhosis. *J. A. M. A.* 134: 676-678, June 21, 1947.

(22) Fleming, R. G., and Snell, A. M.: Portal cirrhosis with ascites; analysis of 200 cases with special reference to prognosis and treatment. *Am. J. Dig. Dis.* 9: 115-120, Apr. 1942.

(23) Karnoff, O. D., and Patek, A. J., Jr.: Natural history of Laennec cirrhosis. I. Liver analysis of 386 cases. *Medicine* 21: 207-268, Sept. 1942.

(24) Hoffmann, J. (New York), and Lisa, J. R.: Significance of clinical findings in cirrhosis of liver; study of 93 autopsied cases. *Am. J. M. Sc.* 214: 525-528, Nov. 1947.

(25) Chapman, C. B.; Snell, A.; and Rowntree, L. G.: Decompensated portal cirrhosis, report (112 cases). *J. A. M. A.* 97: 237-244, July 25, 1931.

(26) Chapman, C. B.; Snell, A.; and Rowntree, L.: Compensated cirrhosis of liver: a study for more extensive consideration of the later stages of disease of hepatic parenchyma. *J. A. M. A.* 100: 1735-1741, Jan. 5, 1933.

clinical icterus. This incidence is commensurate with that reported by Boles et al. (21), but is somewhat less than that reported by others (12, 19, 20, 22, 24). Gottardo and Winters (19) and Kimball et al. (27) have emphasized the relative frequency with which jaundice occurs in the course of portal cirrhosis, attaching pathogenetic significance to the symptom as expressing hepatocellular degeneration and depression of function.

## CORRELATION OF LABORATORY DATA WITH HISTOPATHOLOGIC DIAGNOSIS

### 1. Portal cirrhosis

*Erythrocyte count and hemoglobin.* In 15 of the 27 patients with a histopathologic diagnosis of portal cirrhosis, including 8 patients with fatty metamorphosis, an erythrocyte count was recorded. The average count was 4.2 million (range 2.8 to 5.2). Of the 25 patients on whom hemoglobin determination was made, the average reading was 87 per cent. These findings indicative of a significant incidence of mild anemia are less marked than those reported in the literature.

*Sedimentation rate (Wintrobe).* These determinations were made on 19 of the 27 patients. The average rate was 23 (range 3 to 56). Seventeen of the patients had rates greater than 10 and in 9 the rate exceeded 20.

*Prothrombin time* was used more as a check on the safety of the biopsy procedure than as a function test. It was not unusual to find slight increases in the prothrombin time (23 to 28 seconds) when compared to a control of 20 seconds. The administration of vitamin K for 2 or 3 days usually resulted in slight reduction of the prothrombin time to a level regarded safe for the procedure (25 seconds or less).

*Serum proteins* were determined on 26 of the 27 patients, with fractionation of the total proteins in 20 patients. The average total proteins were 7.3 grams per 100 cc. (range 5.3 to 8.8). Only 2 patients had less than 6 grams of serum proteins. Of the 20 total serum proteins which were fractionated, in only 2 patients was the albumin/globulin ratio reversed (less than 1), although 1 patient demonstrated a ratio of 1. The average of 20 serum albumin determinations was 4.6 grams and the average serum globulin was 2.7 grams. Only 4 patients exhibited serum albumin less than 4 grams. Five patients had a serum globulin in excess of 3 grams.

*Bromsulphalein retention.* This liver function test was performed on 24 of the 27 patients. In 20 of the 24 patients an abnormal quantity of the dye was present in the serum at 45 minutes. All of these retentions were of the order of 10 percent or more. This test is the simplest and most reliable of the liver function tests for the detection of hepatocellular damage in the absence of jaundice.

(27) Kimball, S.; Chapple, W. H., C.; and Saxes, S.; *J. studies in relation to carcinoma of liver*. J. A. M. A. 134: 662-666, June 21, 1947.

*Cephalin cholesterol flocculation and thymol turbidity.* The cephalin cholesterol flocculation test was performed on 24 of the 27 patients with portal cirrhosis including the 8 with fatty metamorphosis. Only 4 positive tests were obtained and the maximum degree of positivity noted was a 2 plus reaction at 48 hours. The thymol turbidity test was performed on 25 patients including the 8 cases in the hypertrophic fatty stage in 11 the test was abnormally elevated. Of these 11 the average was 18 units (range 6.9 to 60). With one exception the abnormal cephalin cholesterol flocculation tests were found in the patients demonstrating the highest degree of thymol turbidity. In the one exception a 2-plus flocculation at 48 hours was associated with a thymol turbidity of 3.5 units. In none of the 8 patients with hypertrophic fatty cirrhosis was either an abnormal cephalin cholesterol flocculation or thymol turbidity test obtained. If these 8 patients are excluded a positive thymol turbidity test was obtained in 65 percent.

*Icterus index and serum bilirubin.* One or more icterus indexes was obtained on 25 of the 27 patients with portal cirrhosis. Of this number 8 had indexes of 10 or more. Serum bilirubin determinations were made on 11 of the 27 patients. Four of these exceeded 1.2 mg. per 100 cc.

*Glucose tolerance test.* A standard oral glucose tolerance test was made on 16 of the 27 patients. Two gave histories suggestive of pancreatic diabetes (glycosuria polydipsia polyuria polyphagia) and their markedly decreased tolerance for oral glucose was thought to reflect both pancreatic and liver disease. Of the remaining 14 cirrhotic patients, 10 showed definite periportal fibrosis, whereas 4 demonstrated fatty metamorphosis in the absence of significant portal area fibrosis. Of the 10 patients exhibiting portal fibrosis 1 had a normal glucose tolerance and 7 demonstrated a mild decrease and 2 a moderate decrease in glucose tolerance. No correlation could be shown between the degree of fatty metamorphosis and the degree of diminished glucose tolerance. All of the other 4 patients exhibited a mild decrease in tolerance.

## 2. Fatty metamorphosis

When the 8 cirrhotic patients whose principal histopathologic features were fatty metamorphosis are grouped with the others demonstrating fatty changes, 2 histologic-functional correlations were suggested. In 10 of 11 patients on whom the bromsulfalein retention test was done there was an abnormal retention. In 5 of 7 patients a decrease in glucose tolerance was observed. There was no disturbance in serum proteins in any of the 12 patients and negative cephalin cholesterol flocculations were obtained in all of 10 patients. In 2 of 11 patients mild increases in the thymol turbidity test were observed. In the structural and functional correlation studies of Franklin et al. (28) no significant relation between fatty changes in the liver and any of the function tests was noted. Diffuse liver cell damage in their

(28) Franklin, M.; Pepper, H.; St. Ignace, F. and Kazell, D. D., Relation between structural and functional alterations [liver]. *Lab. & Clin. Med.* 33: 435-447 Apr. 1948.

weak, and broke out in a cold sweat. The pulse rate increased and the blood pressure fell. To establish a definite diagnosis 10 cc of demerol solution was given intravenously following which he had complete relief of symptoms and 5 hours of sleep followed.

During the next 12 hours he was given 2 further injections of demerol solution and at 1100 on 19 February 18 hours after the onset of symptoms he was started on cortisone acetate by mouth. He was given (1) 100 mg. of cortisone and 0.5 mg. of potassium chloride every 6 hours for 4 doses; (2) 50 mg. of cortisone and 0.5 mg. of potassium chloride every 6 hours for 3 days; and (3) 25 mg. of cortisone and 0.5 mg. of potassium chloride every 6 hours for 1 day. About 1 hour after the first dose of cortisone was given he showed evidence of early shock, and 16 mg. of morphine was given hypodermically. Again at 1500 shock was imminent, and the morphine injection was repeated. By 2200 his general condition had improved. He was able to take food and fluid. By 1200 on 20 February he was completely symptomatic. His appetite increased and on the third, fourth, and fifth days of treatment he ate an average of 4 rations at each of the regular meals extra milk between meals and a midnight ration. During these 3 days he consumed 36 bars of candy and his fluid intake was greatly increased. During this period he was mildly euphoric. Although physically tired he was mentally alert, reading or working mathematical problems. For the entire period of treatment and for 2 days following he was unable to sleep. The night after treatment was terminated, he slept for 2 hours which increased several hours a night until by the fifth night after treatment was terminated he was sleeping 7 or 8 hours nightly.

During the 10 days of posttreatment observation there was no evidence of mental depression. There was no general malaise and his appetite remained good. During the 15 days of hospitalization he gained 15 pounds. He was transferred to a hospital in Japan and was seen 2 weeks later. He had continued to gain weight and his mental outlook was improved.

## DISCUSSION

An addict cannot be trusted to give an honest report of his drug consumption because he believes that by exaggerating his needs he will more easily succeed in obtaining what he desires. The exact amount taken by our patient was reported to be 60 cc. of demerol solution and 1 gram of morphine daily. Although this might have been exaggerated somewhat there is no doubt of his addiction as he had no unusual response to 10 cc. of demerol solution intravenously and no unusual response to repeated dose of 9 and 8 cc. 4 and 8 hours later. The development of severe abstinence symptoms occurred within 24 hours after his admission. Cortisone was administered, and complete relief of symptoms was obtained at the time it would normally be expected for the symptoms to be at their peak.

The above findings are similar to those found by Smith (11) in the treatment of delerium tremens with ACTH. In both acute alcoholic intoxication and delerium tremens (12) it is reported that the drug markedly speeds recovery as compared to that anticipated from conventional therapy. The report of Thorn (13) indicates that in 2 patients with severe personality disorders, one addicted to codeine and the other to morphine attempts at withdrawal during ACTH therapy were unsuccessful.

(11) Smith, J. J.: Treatment of acute alcoholic states with ACTH and adrenocortical hormones. *Quart J Stud. Alcohol* 11: 190-198, Jan. 1950.

(12) Smith, J. J.: Role of Adrenal Gland in Alcoholism. In *Proceedings of the First Clinical ACTH Conference*. J. R. Mote, editor. The Blakiston Co. Philadelphia, Pa. 1950. p. 544.

(13) Thorn, G. W.; Forsham, P. H., Frawley, T. F., Hill, S. R., Jr., Roche, M., Stash, I., D., and Wilson, D. L.: Clinical usefulness of ACTH and cortisone. *New England J. Med.* 242: 865-872, Jan. 1, 1950.



# Treatment of Malignancy of the Testes

James C. Kimbrough *Colonel, MC, U S A (1)*

William H. Morse *Captain, MC, U S A (1)*

OUR purpose in this article is to emphasize the importance of early diagnosis and early and radical surgical procedures in the treatment of malignant tumors of the testes and to report the high mortality and morbidity rates resulting from minor operations and palliative radiation therapy.

## INCIDENCE

Although malignant tumors of the testes are rare, delay in diagnosis and treatment is attended with such high mortality that they should be looked for in every physical examination. They usually occur in patients between 20 and 40 years of age. Because of this age factor, a high incidence is observed when a large number of men are inducted into the service. Between October 1940 and May 1946, Friedman and Moore (2) reported 922 cases at the Armed Forces Institute of Pathology. With the current increase in the Armed Forces, a corresponding rise of incidence may be expected.

Malignant tumors of the testes arise from totipotent sex cells. The monodermal forms of these growths represent one-sided developments of teratomas. These tumors are often mixed in type. If one type predominates, the minor elements may not be found at the pathologic examination. A seminoma (germinoma) which appears monodermal may contain subversive elements of embryonal carcinoma, chorioepithelioma, et cetera. These unrecognized elements at times metastasize independently of the seminoma. The structural pattern may be classified as follows: (1) radio-sensitive—seminoma, and (2) radio-resistant—embryonal carcinoma, teratoma, teratocarcinoma, and miscellaneous tumors.

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(1) Walter Reed Army Hospital, Washington, D. C.

(2) Friedman, N. B. and Moore, R. A. Tumors of the testis; report of 922 cases. *Mil. Surgeon* 99: 573-593, No. 1946.



Seminoma is the precursor of embryonal carcinoma, teratocarcinoma, and chorioepithelioma. Seminomas may metastasize as embryonal carcinomas or other types.

### TREATMENT

Although seminoma are more radio-sensitive than the other types, because they may metastasize as a radio-resistant type radiation therapy alone cannot be depended on to control the tumor spread. Friedman and Moore found 319 patients with seminoma in their series of 922. Metastases were found in 28 of these patients with seminoma. In later report, Friedman (3) noted that of the 28 the metastasis was embryonal carcinoma, teratocarcinoma, or some other type in 11 patients (39.3 percent). This kind of radio-resistant metastasis makes radical surgical excision of the retroperitoneal lymphatics, testis, and spermatic cord the treatment of choice. The operation is followed by appropriate irradiation. The radical treatment has given better results than simple orchidectomy with irradiation.

O'Connell and Geschickter (4) reported the 5-year survival rate for 216 patients with malignancy of the testes treated at the National Naval Medical Center Bethesda, Md. The standardized treatment consisted of ligation of the cord at the internal inguinal ring and excision of its distal portion along with the testis, followed by irradiation.

TABLE 1.—Comparison of survival rates of testis cancer patients

Classification	U. S. Naval Hospital (4)		Walter Reed Army Hospital (3)		Difference
	Number	Percent	Number	Percent	
Radio-sensitive: seminoma —	75	99.6	103	81	21.4
Radio-resistant: teratocarcinoma, embryonal carcinoma —	141	19.1	100	37	17.9
Total —	216	31.7	203	57	25.3

Hampton (5) has summarized the 5-year survival rate of a group of 203 patients evaluated at this hospital. The standardized treatment was radical orchidectomy with resection of the iliac and paraortic lymph nodes, vas deferens, and spermatic vessels, followed by irradiation. Table 1 compares the 5-year survival rate from the two reports.

(3) Friedman, M. B. Comparative morphogenesis of extragenital and gonadal germinal tumors. *Cancer* 4: Mar. 1951.

(4) O'Connell, H. V., and Geschickter, C. F.: Tumors of testes: 5-year follow-up study. *U. S. Armed Forces M. J.* 1: 719-732, July 1950.

(5) Hampton, A. O. Delayed effects of million rads irradiation on gastrointestinal tract and on testicular tumors. Project No. 100, Radiation Therapy Service, Walter Reed Army Hospital, Preliminary Progress Report, Dec. 31, 1950.

## CONCLUSIONS

The treatment of malignant disease by excision of the local tumor is an obsolete measure attended by metastases high mortality and painful death. Cancer is a serious disease and the chances for cure are enhanced by early radical surgical excision. Timid or conservative use of the scalpel leads to dire and fatal consequences. Early diagnosis with radical surgical excision of the tumor spermatic cord, and regional lymphatics is imperative in the management of malignant tumors of the testis.



# Histamine as a Factor in Dental Inflammation

Merle W Ogle *Lieutenant Colonel, DC, U S A. (1)*

Ralph B Lydic *First Lieutenant, DC, U S A. (1)*

**N**ORMALLY a physiologic balance in tissues of the oral cavity is maintained even though a number of factors exist which may predispose to or complicate inflammatory processes. Such factors include erupting teeth local irritants such as fermentative or putrefactive substances excessive bacterial activity occlusal trauma, in excess of ability of supporting structures of teeth to resist damage and other chemical or physical irritants. Conditions may exist in the oral cavity which influence or are influenced by a seemingly remote systemic irregularity. Basic information is necessary to evaluate and differentiate normal and pathologic reactions wherever they may occur. Stimuli associated with normal physiologic processes may deviate from their usual quality and quantity and cause inflammation.

Allergic and anaphylactic manifestations cause inflammation. An example of allergic inflammation is the Arthus phenomenon in which the injection of a substance into an animal previously treated with that same substance results in a severe local reaction. Theories have been advanced that this is caused by a local antigen-antibody reaction a local concentration of a foreign protein; or a general alteration of the mesenchyme a hypersensitivity which increases local reaction.

Allergy is believed to play a part in the inflammation found in infectious diseases including syphilis tuberculosis and rheumatic fever. Acute inflammation of the allergic type is seen in cutaneous flares and wheals, diagnostic skin reaction coryza bronchitis and other conditions which develop in persons who are hypersensitive to specific proteins. The allergic inflammatory reaction is like other inflammations except that the exudate may contain more eosinophils.

Lewis and Grant (2) suggested that a histaminelike substance is involved in the reactions of the skin to injury and that this substance

(1) Brook Army Hospital Fort Sam Houston San Antonio Tex.

(2) Lewis, T and Grant, R. T. Vascular reactions of skin to injury liberation of histamine-like substance in injured skin, the underlying cause of lenticular urticaria and of wheals produced by burning and observations upon nervous control of certain skin reactions. *Heart* 11: 209-261 May 1924.

held normally within cells is released by various types of injury and, diffusing out, causes the early changes in capillary dilatation and permeability which in turn produce local edema and redness. Since this work, investigators have questioned whether or not histamine may play a role in inflammation. That histamine is among the substances released by stimuli has been shown by Rosenthal and Tabor (3).

Histamine itself is a strongly basic water soluble white crystalline compound derived from histidine (one of the essential amino acids) by decarboxylation (4). It is produced regularly in the intestines by organisms of the *Escherichia* group. It is present in the tissues generally and even in the leukocytes but how it is formed in the tissues is not known. Histamine stimulates the gastric secretion, dilates the capillaries and arterioles, lowers blood pressure, constricts the bronchioles, contracts the sphincter of the hepatic veins, dilates the pial vessels and raises the pressure of the cerebrospinal fluid. It is a antagonist to epinephrine and probably acts as a stimulus to its production. It is liberated from the tissues in anaphylactic and allergic reactions and is neutralized by histaminase (5). There is abundant evidence that histamine plays a major role in anaphylactic and allergic reactions.

Most, if not all, of the body cells which exhibit a vigorous metabolism contain histamine as a normal constituent. Stimuli applied to such cells, if strong enough to entail even mild injury, cause this histamine to be liberated from the cells in sufficient amounts to cause dilatation of the adjacent capillaries to a mildly pathologic degree (5). Menkin (6), on the other hand, is not fully in accord with the views held by some other investigators. He has isolated a factor in inflammatory exudate which increases permeability of the capillary wall. It is not a protein substance but contains amino and carboxyl groups, appearing to belong to the relatively simple polypeptides (7). He believes it is not histamine or an H-substance. It has been isolated and crystallized and is called leukotaxine.

In spite of these variations in ideas investigators have shown that well-developed inflammatory areas in laboratory animals and in human beings contain amounts of histamine well above normal. It is clear then that either the increased histamine is brought to areas of inflammation through the blood stream or else some local mechanism is stimulated.

(3) Rosenthal, S. M., and Tabor H.: Improved colorimetric method for estimation of histamine. *J. Pharmacol. & Exper. Therap.* 92: 425-431, Apr. 1948.

(4) Dale H.: Pharmacology of histamine with brief survey of evidence for its occurrence, liberation and participation in natural reactions. *Ann. New York Acad. Sc.* 50: 1017-1028, Apr. 28, 1950.

(5) Zee, L.; Coder, E. T.; and Crigler C.: Presence of histamine in inflammatory lesions. *Arch. Path.* 33: 452-459, Apr. 1942.

(6) Menkin, V.: *Dynamics of Inflammation*. The Macmillan Co., New York, N. Y., 1943.

(7) Dachs, E. S., and Chaim, E.: Polypeptide responsible for some of the phenomena of acute inflammation. *Br. J. Exper. Path.* 20: 417-429, Oct. 1939.

to produce the increased amount. Recent work has clearly shown that this rise in histamine content in inflammation and inflammatory areas is caused by degeneration of accumulated blood platelets in the increased capillary bed in these inflammatory areas. The simplest interpretation of the experiments undertaken by Zon et al (5) is that the platelets bring the increased quantity of histamine to areas of inflammation.

Because of the effect of rutin (vitamin P) on capillary permeability Raiman et al (8) stated that pretreatment with rutin is effective in protecting sensitized animals against anaphylactic shock. These investigations can be correlated with the susceptibility of localized tissue such as gingival margins where there is a localized area of rutin deficiency associated with gingivitis or pocket formations. In such conditions, total destruction of cells has not taken place as is the case when tissue is destroyed by burns, acute infections and extreme pressure from fluid exudate in severe contusions, so histamine has not been destroyed and is present to exert an effect on the tissues or the local areas. In the treatment or drainage of such inflammatory areas histamine or the histaminelike substance is eliminated. These concepts are compatible with findings in the following case.

#### CASE REPORT

A moderately well-nourished, well-adjusted, 33-year-old white woman first experienced allergic symptoms in May 1950. After a routine dental examination at which time the teeth and periodontal pockets were examined and probed, she developed gingival tenderness, urticaria and swelling of her hands and feet to an extent that made their use difficult. She stated also that her tongue was swollen to such extent that speech was accomplished only with some difficulty. She reported for treatment and was given amphetamine. This medication gave her some relief but caused nervousness and sleeplessness for a few days. About 1 month later she was seen in the allergy clinic where she was told that no treatment was indicated at that time inasmuch as she had been symptom free for several weeks.

About 6 weeks later she again had urticaria and moderate swelling of the face following restoration, under local anesthesia, of the carious upper right second bicuspid. At this time she again sought treatment at the allergy clinic and was referred to the dental service for elimination of possible dental foci. It was found that she had a moderate generalized periodontoclasia and a chronic pericementitis of the upper right second bicuspid. Treatment of the periodontal condition was begun and she reported that in the early phases of this treatment she had a rather marked exacerbation of symptoms similar to those previously described. After several treatments all symptoms disappeared and she had no further recurrence except for one mild episode about 7 months

(8) Raiman, R. Later, E. R. and Necheles, H. Effect of rutin on anaphylactic and histamine shock. *Sci ace* 106: 368, Oct. 17 1947

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(8) Raiman, R., Later, E. R., and Neckel, H.: Effect of rutin on anaphylactic and histamine shock. *Science* 106: 368 Oct. 17 1947



later which developed after eating shrimp. Her swelling at this time was mild in degree short in duration, and responded to an antihistaminic agent within a few hours.

### DISCUSSION

In the case reported injured tissues of the traumatized and inflamed areas may have liberated substances to which the patient became sensitive through the mechanism of the Burky phenomenon. The Burky phenomenon is concerned with sensitivity of a person to antigens. Action of a qualitative and quantitative bacterial toxin in the presence of a suitable combination of factors including inflammatory processes, may foster the production of sensitive or allergic states (9). Burky observed that in the process of immunizing rabbits to staphylococcus toxin, they became sensitized to the broth in which the toxin was produced. Proceeding on the theory that a broth hapten (a partial or incomplete antigen) was attached to the toxin he attempted to produce sensitivity to other substances. The protein of the crystalline lens is apparently organ specific, identical in all animals and different from the somatic protein of the animal. Attempts to sensitize animals to lens protein had heretofore been unsuccessful but Burky grew toxin-producing staphylococci in a medium containing lens protein and following injections of this lens-toxin combination into animals he produced sensitization to the protein of the crystalline lens. He next accomplished the same with rabbit muscle protein, sensitizing rabbits to their own muscle.

A person might become sensitive to some of his own tissue products as a result of the activity of staphylococcus or other toxins elaborated in a focus of infection or inflammation, but on testing for sensitivity with any number of pure bacterial cultures all might be negative in spite of the fact that the toxin of one of these bacteria might have been a sensitizing agent under the influence of necessary combinations. Burky also developed the hypothesis that a sensitized animal can react to tissue cells liberated by trauma. Rabbits that had been sensitized to rabbit muscle-toxin antigen so that they reacted positively following resection of this or of rabbit muscle alone, were found to react likewise to simple muscle trauma such as pinching with hemostats. If it should develop that a toxin produced in a focus of infection or inflammation can act as an antigen fraction and increase the antigenicity of ordinarily inert substances it is conceivable that much of what we consider as nonspecific focal infection may later be shown to be specific.

### SUMMARY

A patient with allergic tendencies also had an area of inflammation and edema which was a potential source of histamine or histamine-like

(9) Burky, E. L. Production in rabbit of hypersensitive reactions to lens, rabbit muscle and liver ragweed extracts by action of *Staphylococcus* toxin. *J. Allergy* 3: 466-473, July 1934.

substance. Her oral inflammatory conditions consisted of (1) an irritation of the periodontal membrane of the upper right second bicuspid caused by occlusal trauma or trauma associated with manipulation during cavity preparation (the periodontal membrane may also have been infected because the cavity extended proximally to a point under the gingival margin); and (2) a periodontitis (gingival margin inflammation and edema with pocket formation). The sensitivity of the patient to autogenous tissues, inflammatory exudate, and a nonspecific bacterial toxin may have combined to cause an allergic reaction.



# The Management of Abortion

William S. Baker, Jr. *Commander MC, U. S. N.* (1)

**A**LTHOUGH the proper management of abortion has occupied the interest of many investigators only two methods of treatment have stood the test of time namely bed rest and sedation. Numerous other methods have been used but with no apparent benefit to the patient. Guterman and Tulskey (2) attempted to prove the value of pregnandiol determinations on the urine of patients who threatened to abort. In a series of 335 patients they found that 191 or 57 percent excreted normal amounts of pregnandiol and of these 80 percent went on to term without the addition of extra progesterone. Furthermore the remaining 43 percent excreted less than the normal amount of pregnandiol in the urine 38 of these were given progesterone and 37 or 97 percent aborted. Of the 106 untreated patients in this group the incidence of abortion was also 97 percent. The authors were unable to account for the poor results with progesterone but concluded that it might be of some value if given in much larger doses.

Colvin et al (3) reported the outcome in a series of 1570 patients with untreated threatened abortion (1) 1098 or 69.9 percent went on to term; (2) 318 or 20.3 percent aborted a blighted ovum; (3) 60 or 3.8 percent aborted products showing gross anomalies of the fetus or pathologic conditions of the placenta or membranes incompatible with viability of the fetus (4) 32 or 2.1 percent aborted spontaneously or artificially because of toxemia, abruptio placenta, placenta praevia or a ruptured marginal sinus threatening the safety of the mother and (5) in the remaining 62 or 3.9 percent the cause of the abortion could not be determined. They therefore concluded that only 3.9 percent of these patients could theoretically have been benefited by a specific hormone or vitamin.

Javert et al (4) reported on the treatment of primary and secondary habitual abortion. They (1) placed all patients on a diet high in citrus

(1) U. S. N. val Ho plital Camp Lejeune N. C.

(2) Guterman, H. S., and Tulskey A. S. Observations on use of progesterone in threatened abortion with special reference to pregnandiol excretion. *guide to therapy* Am. J. Obst. & Gynec. 58: 495-502, Sept. 1949.

(3) Colvin, E. D.; Bartholomew A. Grimes, W. H.; and Fish, J. S.; Salvage postabortion in threatened abortion. Am. J. Obst. & Gynec. 59: 1208-1224, June 1950.

(4) Javert, C. T.; Flinn, W. F.; and Standler H. J.; Primary and secondary spontaneous habitual abortion. Am. J. Obst. & Gynec. 57: 878-889 May 1949.

Habitual abortion is usually defined as the spontaneous interruption of three or more successive pregnancies. Javert et al. (4) refer to the primary habitual aborter as one who has been unable to retain any of her first three pregnancies and the secondary habitual aborter as one who has failed to retain three or more pregnancies but not in sequence.

Missed abortion is usually considered by most authorities to be the retention of the dead products of conception within the uterus for at least 2 months before they are expelled. An increase in the size of the uterus, one or more missed menstrual periods and subsequently a cessation of uterine growth will usually suggest the correct diagnosis.

The cause of spontaneous abortion has been the subject of intense interest by numerous investigators. Some of the more common developmental causes are: (1) blighted ovum, (2) hydatid degeneration of the trophoblast, (3) hydatidiform mole, (4) fetal monstrosities and (5) circumvallate placenta. The endocrine system is also known to be a factor in the production of abortions. In hypo-ovarianism there is a poor response by the theca-lutein cells to the stimulating effect of the prolactin of the anterior pituitary gland. This results in a poor output of progesterone and an improperly prepared pregestational endometrium. In hypopituitarism there is a deficient production or lack of pituitary gonadotropic hormone. As a result the corpus luteum is not formed or has little secretory function. The endometrium does not develop into a pregestational type. In hypothyroidism both the pituitary and ovary are inadequately stimulated and the result is a low progesterone effect on the endometrium.

After the fourteenth week of gestation the placenta is the main source of the steroid hormones. It may be unable to secrete the desired output of chorionic gonadotropin, estrogen, and progesterone thereby producing poor endometrial response and contributing to the abortion.

Certain vitamin deficiencies have been believed to cause abortion. Javert et al. (4) noted a persistent low level of vitamin K and C in a series of 79 patients. Based on this fact they treated 24 of 25 patients found to be deficient in both vitamins and claimed a high incidence of success. Other investigators have stated that vitamin E is essential in the organism in order to prevent the development of fetal anomalies. This has led to the empirical use of this vitamin during the pre-conceptional state.

Trauma, both accidental and purposeful, has been a potent factor in the cause of abortion. Travel during the early months of pregnancy is not sanctioned by most obstetricians as it is believed to incite uterine contractions. Intercourse near or during the time of theoretical menstruation may also be a cause in some patients. The role of abortifacient liquids and paste and of illegal dilation and curettage needs no further comment. Miscellaneous causes of abortion include neoplasms, congenital malformations and retrodisplacements of the uterus.

*Medicolegal aspects.*—In North Carolina criminal abortion is a felony punishable by not less than 1 year and not more than 10 years in prison plus a fine to be determined by the court. The law states in essence that the interruption of any pregnancy following a period of 30 days from the alleged impregnation at any time up until term if not performed for the benefit of the mother is an illegal abortion. Therapeutic abortion is recognized in the statutes of many states.

*Management.*—Very little can be done at the time the patient threatening to abort presents herself for treatment. As a result, those who see these cases are perhaps too easily swayed by unreliable and prejudiced information and order all kinds of expensive hormones, drugs, and vitamins in the desperate hope that perhaps this is the one patient who may be helped by such medication. It is necessary that we attempt to treat these patients on a more rational basis.

When a patient presents herself complaining of cramping and bleeding in the first trimester of pregnancy, I believe the following precautions should be taken: (1) make a speculum examination carefully if bleeding is profuse or within 24 hours of admission to the hospital if the patient is not bleeding heavily; (2) order complete bed rest if she has bleeding and cramping; (3) request a Friedman or Aschheim-Zondek test to determine the viability of the ovum; (4) request urinary pregnandiol determinations and if under 5 mg. per 24 hours give 25 mg. of progesterone intramuscularly every 4 hours; (5) determine the prothrombin time to reveal vitamin K deficiency; (6) give 100 mg. of vitamin C daily on an empirical basis; (7) give 100 mg. of meprobamate immediately and every 4 hours until symptoms have subsided or abortion is complete; (8) allow the patient to be up if there is no bleeding after 48 hours; and (9) discharge home on Smith and Smith regimen after she has been ambulatory and asymptomatic for 24 hours.

If the abortion is incomplete it is necessary either to treat the patient conservatively or to empty the uterus by dilatation and curettage. We prefer to proceed conservatively as follows: (1) await the spontaneous emptying of the uterus and remove with ring forceps all products of conception visible in the cervical canal; (2) give one ampul of oxytocin injection followed by  $\frac{1}{2}$  ampul every 4 hours until a total of 4 ampuls have been given; (3) give 300,000 units of procaine penicillin b.i.d. if any signs of infection are present; (4) allow patient to be up and observe for bleeding; (5) discharge home after 24 hours if bleeding is minimal; (6) curette after 10 days if bleeding persists; and (7) examine the patient after 6 weeks to determine whether involution is complete.

If for any reason induced abortion is suspected, infection must be considered to be present. An examination for trauma to the cervix may be made and if found is strong evidence of an illegally induced abortion. Such patients should all be managed conservatively as follows: (1) obtain a statement from the patient absolving you and the hospital



# Betel Nut Chewer's Cancer<sup>(1)</sup>

Ralph W Mendelson Colonel U S A F R. (MC)

**C**ANCER of the oral tissues is a not uncommon condition in people who chew betel nut. The existence of these cancers and their associated cause have been known for many years. The custom of chewing betel nut prevails throughout the tropical Far East and is much more pernicious than the chewing of tobacco. The "cud" is made of betel nut with a small amount of slaked lime wrapped in the leaf of the betel palm. It is a very pungent astringent, and slightly stimulating mixture. According to Webster's Unabridged Dictionary the nut proper contains beside tannin the following alkaloids all of which are pyridine derivatives (1) arecoline the methyl ester of arecaidine a por-



Figure 1 Teeth of betel nut chewer

sonous liquid to which medicinal properties have been ascribed; (2) arecaidine (2), a nontoxic crystalline acid, (3) arecolidine a crystalline isomer of arecoline (4) arecaine (2), a crystalline methyl derivative of guvacine (5) guvacine a crystalline substance and (6) guvacoline the crystallizable methyl ester of guvacine

Continued use of the "cud" results in retraction of the gums severe pyorrhea and loosening of the teeth which become stained an ebony black (fig 1). The mechanical irritation from the protruding teeth and

(1) From study made in Siam where the author was Medical Adviser to the Royal Siamese Government.

(2) Editor's note: According to the United States Dispensatory 24th edition, arecaidine and arecaine have been shown to be identical.





Figure 2. Papilloma of lip in betel nut chewer. Figure 3. Drawing of cross section of lesion shown in figure 2. Figure 4. Carcinomatous degeneration of papilloma of lip in betel nut chewer. Figure 5. Drawing of cross section of lesion shown in figure 4.



Figure 6. Carcinomatous degeneration of papilloma of lip and metastatic growth in cheek in betel nut chewer. Figure 7. Drawing of cross section of lesion shown in figure 6. Figure 8. Carcinomatous degeneration of papilloma of lip in betel nut chewer. Figure 9. Drawing of cross section of lesion shown in figure 8.

the chemical effect of the betel nut mixture seem to be the determining factors in the production of a malignant neoplasm of the oral tissues. Primarily the growths are papillomatous in character (figs. 2 and 3) later becoming malignant (figs. 4-13). Although one of the alkaloids, *recolline*, is supposed to possess antimycotic properties, many betel nut users suffer from a mycotic infection of the lips (fig. 14). A fungus may be obtained from the cud that is identical with that found in the lesions. Furthermore, treatment of the skin lesions is of no avail unless the patient ceases to chew betel nut.

I seldom saw a patient in the early stage of his disease and, unfortunately, most of them had been treated by native healers with a variety of irritating application. Those with papillomatous growths only were successfully treated but were reluctant to accept the chewing of betel nut as the cause of their disease. Betel nut cancer is a striking ex-

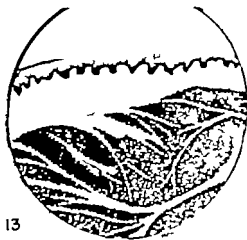


Figure 10. Carcinomatous degeneration / papilloma of tongue in betel nut chewer. Figure 11. Drawing of cross section of lesion shown in figure 10. Figure 12. Endothelial sarcoma of tongue in betel nut chewer. Figure 13. Drawing of cross section of lesion shown in figure 12.



*Figure 14. Mycotic infection of lips in betel nut chewer*

ample of a malignancy caused by self inflicted and preventable irritation which is difficult to control because of the nature of the habit underlying the cause

Editor's note Davis (3) reported on betel nut cheek cancer as observed at the Philippine General Hospital, Manila. In 49 patients with cheek cancer he found that 81 percent chewed betel nut. The site of the growth corresponded to the position in which the cud was held. Spitzel, Davidson, and Turner (4) have shown that cancer of the cheek is the most common malignant growth in Ceylon. They believed it to be due to the irritation caused by betel chewing. Bentall (4) stated that cheek cancer is common in Travancore, South India, where betel nut chewing is widely practiced, and that out of 1 700 patients with this form of cancer, 70 percent chewed betel nut.

(3) Davis, G. G.: Bony cheek cancer with special reference to etiology. *J. A. M. A.* 64: 711-718, Feb. 27, 1915.

(4) Cited by Manson-Bahr, Sir P. H., in Manson, *Tropical Diseases*, 13th edition. The Williams & Wilkins Co., Baltimore, Md., 1950, chap. 2, p. 33.

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# Foreign Bodies in the Lip

J P Echemach *Lieutenant Commander DC, U S. N. R.*

**F**OREIGN bodies in the soft tissue around the oral cavity are frequently encountered following traumatic injuries resulting from accidents and combat casualties. It is advisable to explore thoroughly by means of probe palpation, or radiographs lacerated areas of the face when the patient is first seen. The following case report illustrates one of these complications which easily may be overlooked by even an experienced examining officer.

## CASE REPORT

Examination of the oral cavity of a 24-year-old man revealed an excessive swelling of the lower lip and two hard masses 4 mm. to the left of the median line in the fleshy structure of the lower lip. The area was tender when palpated or when the lip was pressed against the lower incisor teeth. The incisal third of the upper left central incisor was completely fractured (fig 1) as a result of an automobile accident



*Figure 1. Roentgenogram showing defect in the upper left central incisor.*

*Figure 2. Roentgenogram of lower lip showing superimposed foreign bodies.*

2 weeks earlier. Signs of a laceration which had healed with no apparent complication were noted on the vermillion surface of the lower lip adjacent to the left incisor teeth. A dental radiograph of the area (fig 2) clearly showed the two fragments of the upper central incisor superimposed on each other imbedded in the fleshy structure of the lower lip.

Under local anesthesia an incision 1 inch in length, was made on the internal surface of the lip care being taken not to incise the external vermillion surface. This method of entry into the fleshy tissue avoided the formation of a disfiguring scar on the normally visible ex-

ternal surface. The fragments were readily removed and the incision closed.

#### COMMENT

Minor surgical operations such as this can be readily performed by the dental officer in the dental operating room, but a more thorough examination at the time this patient was seen, immediately after injury, would have led to the discovery and removal of the fragments and would have obviated the later procedure.

# A Volunteer Blood Donor Program<sup>(1)</sup>

John A. Mikulak, *Lieutenant Colonel, MSC, U. S. A.*

**B**ECAUSE whole blood has become a vital item in the treatment of patients in our general hospitals the commanding general of the Army Medical Center decided that a volunteer blood donor program should be handled by the Center in cooperation with the American Red Cross instead of being an integral part of the Red Cross program. This decision placed a grave responsibility on Army Medical Center personnel. A committee was appointed to work out the details of the program. This committee consisted of the commanding general as chairman, the executive officer of the Army Medical Service Graduate School, the troop commander, a representative of the Army Nurse Corps, the chief of the manpower analysis branch, the executive officer of the Army Prosthetics Research Laboratory and an information specialist experienced in publicity techniques. With the exception of the information specialist the committee represented the principal groups that make up the Center.

Although other Armed Forces installations in the area are served by the Center's blood bank, the committee's task was limited to a program for donations from personnel of the Center. At the first committee meeting we started by thinking in terms of the familiar annual campaigns for funds, but it was soon recognized that a campaign for donations of blood each week every week throughout the year would require a different approach. For one thing an excess of donors one week would probably be more of a liability than an asset. Consequently we divided the Center's personnel into groups, each group under the leadership of a "keyman" as in other campaigns. Because success depends largely on the effective follow-up of keymen, these were carefully chosen from the standpoint of leadership. They were also people in positions to command the attention of those in their groups. At first we thought it would be better to divide personnel into groups of equal numbers in order to make the competitive standing of the different groups more obvious, but we finally decided that group pride would work more effectively by the division into groups following functional

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(1) Army Medical Center, Washington, D. C.



lines. This meant that some groups were much larger than others. In order to highlight the competitive aspect, each group was assigned a weekly quota based on its numerical strength. A box score chart showing which groups were meeting their weekly and accumulated quotas, and which were not was designed.

Fixing the quota for each group was complicated by the differences in the size of the groups. We had a fixed target—an estimated need of 35 pints of blood a week from Center personnel. This worked out to 1 person in each 100 being required to give 1 pint each week. Troop command, our largest group has a quota of 10 and consistently goes over its quota every week. The smallest group contains only 3 members, and could meet its quota with a donation of 1 pint every 20 weeks. The odd numbered groups were harder to figure. The School group, for example, has 284 potential donors making a weekly quota of 2.84 pints. This works out to a quota of 3 pints a week for 6 weeks, 2 pints for the following week in recurring cycles of 7 weeks. Although the periodic change in quota is not desirable, the advantages of having a group that consists only of those who work together and can be expected to feel a team spirit outweigh the disadvantages.

We now believe that several of the smaller groups should be combined, so that contributions from each group will be fairly frequent. The fact that the group of 3 is behind in its small quota seems to indicate that an obligation due only every 20 weeks is likely to be overlooked.

For purposes of concentrating our efforts one day (Tuesday in this instance) was picked as Army Medical Center day at the blood bank. The blood donor center is open during designated hours in the morning and afternoon and for 2 hours in the evening. Although donors from the Center may give at any time on any day the blood donor center is open, Tuesday gives us a focal point during the week on which to fix attention, but, a donor's group is credited with his donation regardless of the day he contributes.

The question of recognition for donors was considered especially important in view of the recent decision of the Department of Defense to eliminate payment for blood donors. Regular donors accustomed to being paid would probably continue to donate for purely human reasons but we believed it would be easier to maintain their cooperation if the moral satisfaction which must now replace the former cash reward could be reinforced with tangible recognition of contributions. In addition to the Red Cross blood-drop pin and a card noting the blood type and dates of contributions it was decided to add personal letters of recognition from the commanding general to those donating more than once and to publish the list of donors each week in the Center's newspaper as part of the publicity program.

The organization set up to insure the continued working of the program is headed by the commanding general and includes a supervisory committee which presently consists of members of the original survey committee (membership will be changed periodically in order to spread the work); the keymen of the various groups the Red Cross and military personnel of the blood bank and the publicity director who works with the full cooperation of the Center's newspaper. The committee believed that one of the most important factors in the success of the program was getting a key man or woman to take charge of the program at each level. The commanding general heads our program signs the directives and the letters of recognition and occasionally addresses meetings of the key personnel. The keymen are really what the name implies. With initial impetus and continuing support from the commanding general it is up to them to sustain the momentum week after week and month after month.

To keep the blood flowing into the bank at a steady pace after the first enthusiasm has worn off we have found the most effective tools are charts kept by the keymen. If each keyman has a roster of his potential donors and a record of when they have contributed, he is in a position to remind those who have not given blood as well as those whose second donation is due. He knows just where to look for volunteers. Also he has a record of any in his group who for one reason or another are not able to contribute. We find that the keymen who keep such records for their own guidance are much more dependable than those who just look at the calendar each week and try to round up their quota of volunteers without knowing accurately who has already donated or when. Record keeping is vital not only at the keyman level but at the blood bank and in the publicity department. Nothing dampens the enthusiasm of a donor more thoroughly than having his name omitted from the week's honor list and nothing ruins the morale of a group and its keyman faster than having another group get credit for its donors. Even misspelling a donor's name in the published list may affect his determination to come back and give another pint of blood a few months later.

The blood bank personnel are important too. Their attitude sympathetic and cheerful or otherwise has a tremendous effect especially on those donating blood for the first time. Military personnel are assigned to the blood bank staff with volunteer Red Cross workers manning the canteen and keeping the records. From the beginning the military personnel have been an asset to the program by encouraging donors and taking pains to explain the process "beyond the actual call of duty." The volunteer Red Cross workers have been as efficient and helpful as if it were one of the Red Cross's own blood centers, and their willing cooperation has made the job much easier.

The Medical Illustration Section made up a large chart to hang in the blood bank showing the weekly and cumulative standing of the various groups. The score on this chart is published each week in the post newspaper for all to see. The Medical Illustration Section also worked out an effective exhibit for the School group (fig. 1) in which

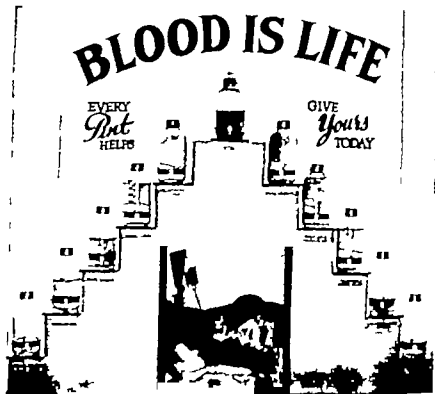


Figure 1.

the level of red fluid in blood-collecting bottles labeled with the names of the different sections in the School is raised as each section meets its quota.

Besides publication of the weekly and cumulative score chart, publicity has included a short news story in the Center's newspaper each week, which serves as the lead for the week's honor list. A photograph of an outstanding donor, a group that has volunteered in a body, or a distinguished visitor who stops in to give blood, is included as often as possible and occasionally a dramatic new picture of blood being administered on the battle field or shipment of whole blood to Korea. Sometimes the story is of a human-interest incident at the bank, sometimes a personality piece about one of the donors. Occasionally we use a short informational piece on blood types and typing and why they are important; on the place of the new plasmas

expanders in saving lives emphasizing that they do not take the place of whole blood, or we can use this space to compliment a group that is doing well. On occasion we use a short humorous article.

Far more important than the general publicity is the element of personal contact. News stories and pictures, honor rolls and letters of thanks can not take the place of the keyman who knows how long it has been since each member of his group donated blood, and who is sincerely concerned with getting the right number of donors to report each week. The generalized work can create an atmosphere of acceptance toward the blood bank but it is the personal follow-up that actually brings the donors to the bank.

Any program of this kind must be adapted to local conditions. Many of the details of our program would not apply elsewhere and indeed we are constantly modifying them here but the main features as outlined above can perhaps serve as a guide for others setting up similar programs.



# Coarctation of the Aorta

James H. Forsee, Colonel, MC, U S A. (1)

Henry W Swan, II AL D (2)

Edwin M. Goyette, Colonel, MC, U S A (1)

Harry P Makel, Major MC U S A. (1)

THE nation's increasing demands for conservation of manpower requires the retention of young men and women in the military service and reconsideration may well be given to the question of certain congenital cardiovascular defects which have occasionally been the cause for separation from the Armed Forces. The correction of the adult type of coarctation of the aorta by surgical means should permit a person to perform full military duties and should alter the previously unfavorable prognosis for normal longevity. Persons of military age suffering from coarctation of the aorta are easily detected by noting the presence of an elevated blood pressure in the upper extremities and the absence or weakness of arterial pulsations with a decreased or absent blood pressure in the lower extremities. Arterial angiography is an adjunct in the diagnosis of this condition. The condition is usually correctable in young adults and patients are thereby restored to full physical fitness for military duty. Three patients treated during recent months are briefly reported.

## CASE REPORTS

*Case 1*—A robust 17-year-old student at an Air Force Training School complained of repeatedly going to sleep while attending classes. He was a high school graduate but had not participated in athletics as his family physician had advised against such activities because of high blood pressure. A thorough clinical investigation revealed full and bounding radial pulsations, brachial blood pressure between 190/100 and 150/100, impalpable femoral pulsations and no audible blood pressure in the right leg and in the left leg a feeble but audible pressure of 100/80. The heart sounds were easily heard throughout the left thorax and a grade II systolic murmur was present. Visible pulsations were noted on the chest wall in the region of the tenth rib. Roentgenograms revealed notching of the under surface of the left fifth and sixth and the right sixth and seventh ribs. Angiocardiography was unsatisfactory. A diagnosis of coarctation of the aorta was made and an operation per-

(1) Fitzsimon Army Hospital, Denver, Colo.

(2) Department of Surgery, Colorado Medical School, Denver, Col.

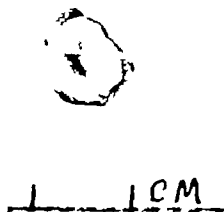


Figure 1.—Lumen of resected aorta showing constriction.

formed. The constricted area was about 7.5 mm. long. The aorta both proximal and distal to the constricted area was appreciably narrowed. The subclavian artery was quite large and anastomosing it to the aorta was considered, but this was not done. The constricted area was resected and the two ends of the aorta sutured after the methods of Crafoord and Nylin (3) and Gross (4). The lumen of the constricted area was constricted to a diameter of only 1.2 mm. (Fig. 1). The new opening resulting from the anastomosis of the two ends of the aorta was 1 cm. in diameter. The postoperative course was uneventful.

The patient noted a definite increase in the warmth of his lower extremities. The postoperative brachial blood pressure was 140/80 and in the lower extremities was 110/84. The patient returned to full military duty and a favorable prognosis as to longevity is predicted.

**Case 2.**—A 29-year-old man who had been in the military service for 10 years had been hospitalized 7 times in that period and had received medical attention on several other occasions for minor illnesses and injuries. He had been examined for re-enlistment twice, treated by private physicians because of high blood pressure, and his application for life insurance had been rejected by a commercial company. He was admitted to Fitzsimons Army Hospital in June 1950. For 3 years prior to admission he had intermittent, severe headaches lasting from 6 to 12 hours and often associated with nausea. In October 1949 he fainted while engaged in moderately strenuous work. His blood pressure was equal in both arms and varied from 160/90 to 190/110. There was a systolic cardiac murmur. The blood pressure was not audible in either leg. Electrocardiograms revealed first degree atrioventricular block and defective intraventricular conduction. Roentgenograms of the chest revealed notching of the third to fifth ribs on the left. The retinal vessels were tortuous with increased light reflexes. A diagnosis of constriction of the aorta was made. He underwent surgical excision of the constricted area and an end-to-end anastomosis of the aorta on 27 June. A section of the aorta 1 cm. long was removed. The lumen of the excised vessel tapered abruptly to slit-like orifice with patency back

(3) Crafoord, C., and Nylin, G.: Congenital constriction of aorta and surgical treatment. *J. Thoracic Surg.* 14: 347-361, Oct. 1945.

(4) Gross, R. E.: Discussion of motion picture presentation on "Surgical Treatment of Constriction of the Aorta" by Dr. Clarence Crafoord. *J. Thoracic Surg.* 16: 256-257, 1947.

could not be demonstrated without trauma to the tissues. The postoperative course was uneventful. Postoperative blood pressure in the lower extremities varied from 110/70 to 120/80 and the femoral arterial pulsations were forceful. The patient returned to full military duty with the military police. The determination of the blood pressure in the lower extremities earlier in his career would doubtless have revealed information leading to the diagnosis of coarctation of the aorta.

**Case 3.**—A 19-year old soldier was hospitalized in Germany in March 1950 because of an acute upper respiratory infection. Physical examination revealed a brachial blood pressure of 180/94 bilaterally, a loud systolic murmur heard over the entire anterior portion of the chest, no audible blood pressure in lower extremities, indistinct pulsations of the femoral vessels, and absence of pulsations in the popliteal and ankle areas bilaterally. The ECG was normal. Roentgenograms of the chest revealed notching of the left fourth and fifth ribs. Because of these findings a clinical diagnosis of coarctation of the aorta, adult type, was made and the patient was transferred to Fitzsimons Army Hospital for operation. The aorta was found to be markedly constricted an inch below the junction with the left subclavian artery which was markedly enlarged. The coarctated area was excised and an end-to-end anastomosis of the aorta performed. The internal diameter of the coarctated area was less than 2 mm. Femoral pulsations were easily palpable immediately after operation and the postoperative blood pressure in the lower extremities was 140/105 and in the upper extremities was 140/95 bilaterally. Popliteal and dorsalis pedis arterial pulsations were easily felt. The patient returned to full military duty and participated actively in sports. This case report illustrates the ease with which the diagnosis of the adult type of coarctation of the aorta can be made.

### SUMMARY

Coarctation of the aorta is occasionally encountered in military personnel. The diagnosis is easily made if the blood pressure is taken in all extremities in young adults with hypertension. The surgical correction of this defect permits the patient to perform full military duty, altering an unfavorable prognosis as to longevity to normal.



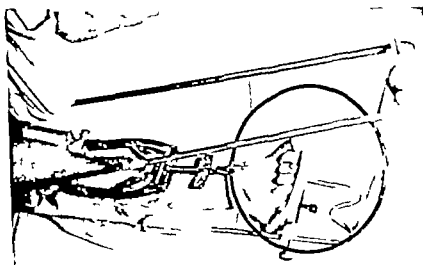


# A Foot By-Pass Apparatus for Treating Fractures of Femur

August W Spatler Colonel MC, U S A

John J Brennan, Lieutenant Colonel, MC, U S A

OUR purpose in this article is to present an apparatus to improve the treatment of fractures of the femoral shaft with skeletal traction. This is accomplished by the use of a metal ring placed in the line of traction over the foot. This causes the traction to by-pass the foot. This apparatus has been used by the senior author



*Figure 1 Foot by-pass apparatus in use.*

since 1937 Its use has permitted traction to be employed in the long axis of the femur with the knee extended This is an important feature as we believe that in treating fractures of the femur by skeletal traction the knee extension should be accomplished as soon as possible

The apparatus consists of a metal ring which is constructed in the brace shop of one-quarter inch cold rolled steel shaped and welded into a circle Rings 7 and 10 inches in diameter are made and stocked with the orthopedic equipment. Rectangular and triangular shapes have been tried but have no advantage

After the usual skeletal traction is set up the ring is attached by hook to the handle of the Kirschner wire tractor in such a manner as to encircle and clear the extended foot and the lower overhead suspension ropes of the splint. A rope passes to the traction pulley (fig. 1). When the healing of the fracture warrants change in knee position, the transition to extension from the flexed position of the knee is accomplished with ease. The foot clears the apparatus and the direction of pull of the traction rope need not be altered to clear the foot. It is impossible for the foot to strike the rope and discomfort to the patient is avoided.

Early institution of knee movement by conversion of the Pearson attachment to an exerciser is facilitated by the use of the metal ring by-pass of the foot. It helps prevent ankylosis of the knee. The patient is able completely to extend the knee with full clearance for the foot at any time. Using full extension of the knee as the resting position in the intervals between the exercise periods is also facilitated by the use of the ring. Conventional positional foot splints to prevent equinus contracture can readily be used with the metal ring.

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- The Diagnosis and Treatment of Adrenal Insufficiency** by *George W. Thorn*, M.D., M.A. (Hon.) LL.D. (Hon.) Hersey Professor of the Theory and Practice of Physic Harvard Medical School and Physician-in-Chief Peter Bent Brigham Hospital Boston Mass. with the collaboration of *Peter H. Forsberg*, M.D. M.A. (Cantab.) Instructor in Medicine Harvard Medical School and Junior Associate in Medicine Peter Bent Brigham Hospital Boston Mass. and *Kendall Emerson*, J. M.D. Assistant Professor Harvard Medical School and Senior Associate in Medicine Peter Bent Brigham Hospital Boston Mass. 2d edition. 182 pages. Publication Number 29 American Lecture Series A Monograph in American Lectures in Endocrinology Charles C. Thomas Publisher Springfield, Ill. 1951 Price \$5.50
- Annual Review of Medicine Volume 2** by *Windsor C. Cutting*, Editor Stanford University School of Medicine and *Henry W. Newman*, Associate Editor Stanford University School of Medicine 485 page Annual Reviews, Inc. Stanford Calif. publisher 1951 Price \$6.
- Chest X-ray Diagnosis** by *Max Ritvo*, M.D. Assistant Professor of Radiology Harvard Medical School Instructor in Radiology Tufts Medical School Roentgenologist-in-Chief and Director, Department of Radiology Boston City Hospital, Associate Radiologist Beth Israel Hospital Boston Mass. Radiologist, Jewish Memorial Hospital Jewish Tuberculosis Sanatorium of New England, Revere Memorial Hospital, and Hudson Hospital 558 page 615 Illustrations. Lea & Febiger Philadelphia, Pa., publisher, 1951 Price \$15
- An Introduction to Modern Psychology** by *O. L. Zangwill*. 227 pages 20 illustrations. Philosophical Library New York N.Y. publisher 1950. Price \$3.75
- Adventure in Mental Health Psychiatric Social Work with the Armed Forces in World War II. A Symposium** by *Betty P. Broadhurst*, *Irving Brodsky*, *Elwood W. Camp*, *Almena Dawley*, *Ethel L. Ginsburg*, *Irving Greenberg*, *Frank T. Grevting*, *Stacey Hechtler*, *Alfred J. Kahn*, *Henry S. Maas*, *Daniel E. O'Keefe*, *Daniel L. Prosser*, *Myron J. Rockmore*, *Elizabeth H. Ross*, *Forrest H. Whitney* and *Imogene S. Young*. Edited by *Henry S. Maas*. 334 pages. Columbia University Press New York, N.Y., publisher 1951 Price \$4.50
- Army Medical Library Classification, Medicine. Preclinical Sciences-QS-QZ, Medicine and Related Subjects-W** 1st edition. 275 pages. For sale by the Superintendent of Documents U.S. Government Printing Office Washington D.C. 1951 Price \$1.25

- Röntgen Manifestation of Pancreatic Disease** by Maxwell Herbert Poppel, M.D., F.A.C.R. Associate Professor of Clinical Radiology, New York University Bellevue Medical Center; Associate Roentgenologist, New York University Hospital; Associate Radiologist, Mount Sinai Hospital; Roentgenologist, Welfare Island Dispensary; New York City Consultant in Radiology, United States Naval Hospital, St. Albans, Long Island, N.Y.; Attending Consultant in Radiology, United States Veterans Administration Hospital, Bronx, N.Y.; Commander MC, U.S.N.R. 389 pgs. Illustrated. Charles C Thomas publisher, Springfield, Ill., 1951. Price \$10.50.
- The Neurosis: Diagnosis and Management of Functional Disorders and Minor Psychoses** by Walter C. Alvarez, M.D., Professor of Medicine Emeritus, Mayo Foundation, University of Minnesota; Emeritus Consultant in Medicine, the Mayo Clinic. 667 pgs. W. B. Saunders Co. Philadelphia, Pa., publisher, 1951. Price \$10.
- Treatment of the Nephrotic Syndrome** by Lee E. Farr, M.D., Chairman, Medical Department, Brookhaven National Laboratory; Physician-in-Chief, Brookhaven National Laboratory Hospital, Upton, Long Island, N.Y. Publication Number 64, American Lecture Series. A monograph in American Lectures in Circulation. 61 pgs. Charles C Thomas Publisher, Springfield, Ill., 1951. Price \$1.75.
- Low Medical Lectures: Companion Ship of Water and Electrolytes in the Organization of Body Fluids** by James L. Gamble, Emeritus Professor of Pediatrics, Harvard Medical School. Stanford University Publications, University series Medical Sciences Volume V Number 1. 90 pages; 42 illustrations. Stanford University Press, Stanford, Calif., publisher, 1951. Price \$2.50.
- Anesthesia in General Practice** by Stuart C. Cullen, M.D., Head of Division of Anesthesiology, Department of Surgery, State University of Iowa Hospital; Professor of Surgery (Anesthesiology), State University of Iowa College of Medicine. 3d edition. 292 pages illustrated. The Year Book Publishers Inc., Chicago, Ill., 1951. Price \$4.50.
- Endoscopy: A Related to Diseases of the Bronchus, Esophagus, Stomach, and Peritoneal Cavity** by Edward B. Benedict, A.B., M.D., F.A.C.S., Assistant Clinical Professor of Surgery, Harvard Medical School; Endoscopist, Massachusetts General Hospital, Boston, Massachusetts. 373 pgs. Illustrated. The Williams & Wilkins Co., Baltimore, Md., publisher, 1951.
- Practical Clinical Psychiatry** by Edward A. Strecher, A.B., A.M., Sc.D., Litt.D., LL.D., M.D., Professor of Psychiatry, School of Medicine, University of Pennsylvania; Franklin G. Ebaugh, A.B., M.D., Professor of Psychiatry, University of Colorado School of Medicine; Director, Colorado Psychopathic Hospital; and Jack R. Ewalt, M.D., Professor of Neuro-Psychiatry Administration of Hospitals, University of Texas Medical Branch, Galveston, Texas. Section on Psychopathologic Problems of Childhood, by Lee Kanner, M.D., Associate Professor of Psychiatry, Johns Hopkins University School of Medicine. 7th edition. 505 pgs. Illustrated. The Blakiston Co., Philadelphia, Pa., publisher, 1951. Price \$7.

## BOOK REVIEWS

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**Bases of Human Behavior: A Biologic Approach to Psychiatry** by *Leon J. Saul*, M.D. Professor of Clinical Psychiatry, University of Pennsylvania School of Medicine. Psychiatric Consultant, Swarthmore College. Lecturer, Bryn Mawr College. 150 pages. Illustrated. J. B. Lippincott Co., Philadelphia, Pa. publishers 1951. Price \$4.

This book should be required reading for those who wish to understand their patients whether medical, surgical, or psychiatric. Because "every disease and every disorder occurs in a human being who is tense with emotion," the physician who is aware of this but not really certain of how the emotions disturb the personality or what part emotions play in both physical and mental disease can, in one evening of pleasurable reading, re-acquaint himself with the important biologic and physiologic principles underlying human behavior. Dr. Saul skillfully blends the contributions, discoveries and research findings of our outstanding men of science and medicine in a way that places the new science of psychodynamics on a firm foundation. The work of such men as Cannon, Pavlov, Sherrington, Virchow, Selye, Wolf and others is so integrated as to form a concept of the whole person that will interest even the most organically minded physician.

Dr. Saul writes vividly and illustrates biophysiologic facts with highly pertinent examples from life literature, poetry and aphorisms that combine to make this book highly entertaining reading. His condensation of material prevents a detailed exposition of the proof for many facts presented pragmatically and dogmatically. For the busy practitioner this may be advantageous. Those who want to delve deeper should read the same author's "Emotional Maturity."

—Lt. Col. L. E. Getto U.S.A.F. (MC)

**Annual Review of Physiology** by *Victor E. Hall*, Editor, Stanford University; *Jefferson M. Crismon*, Associate Editor, Stanford University; and *Arthur C. Gess*, Associate Editor, Stanford University. Volume XIII. 457 pages. Annual Reviews Inc., Stanford, Calif. publishers 1951. Price \$6.

In a prefatory chapter Dr. Carl J. Wiggers reviews physiologic concepts held between 1900 and 1920 giving an account of his participation in the changes which have evolved. In this chapter many of the important contributions of physiology and the part played by the outstanding men of the late nineteenth and early twentieth centuries are traced.

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the memory. The book is divided into "The Anatomy of the Normal" and "The Anatomy of the Abnormal." The latter includes such practical topics as the anatomic bases of clinical tests such as Trendelenburg sign, the limbs of poliomyelitis and lesions of the intervertebral disks. The section on surgery of the sympathetic nervous system has been brought up to date and is made especially lucid by the use of the excellent diagrams. This book should be a valuable asset to the students of anatomy to those surgeons who are preparing for various board examinations to instructors of anatomy and to those who are occasionally called on to lecture on surgical procedures.

—Lt. (jg) E. E. Black M.C., U. S. N.

**Know Your Teeth, A General Review of Everyday Questions (With Answers) asked Daily by Dental Patients** by Walter Neal Gallagher D.D.S., Graduate of the School of Dentistry of Temple University Philadelphia, Pa., Class of 1935. Intern at Forsyth Dental Infirmary for Children, Boston, Mass. Intern at the Temple University Hospital, Phila. Pa. Extern at Hahnemann Hospital Philadelphia, Pa., practiced General Dentistry Hazleton, Pa. 1936-1942, Member of the United States Naval Dental Corps, Member of the American Dental Association; Author of Complete Dental Review 81 pages illustrated. Exposition Press New York, published here 1950. Price \$2.

This book written in a clear, concise manner using simple words understandable to a layman throughout, and consists of questions and their answers. It covers dental problems encountered from birth to the edentulous stage explaining the formation and eruption of the teeth, caries, the effects of early loss of deciduous teeth, oral hygiene, orthodontics, dento-oral diseases and prosthetics.

This book is highly recommended for laymen and dental technicians.

—Lt. Col. G. S. Moore U. S. A. F. (DC)

**Psychiatric Aspects of Juvenile Delinquency** A study prepared on behalf of the World Health Organization as a contribution to the United Nations programme for the prevention of crime and treatment of offenders by Lucien Bover, M.D. Consultant in Mental Health, World Health Organization. Médecin-chef de l'Office Médico-pédagogique rattaché au Département de Justice et Police de l'Etat de Vaud, Lausanne Switzerland. 90 pages. Published by World Health Organization Palais Des Nations Geneva, 1951 Price \$1.

The author, appointed by the World Health Organization presents a compact but comprehensive study of the current concepts of the problem of juvenile delinquency derived from consulting 150 specialists in this field and visiting 60 institutions in various European countries as well as in the United States. He does not attempt to offer any new solutions but presents an extensive review of the subject. The lack of precise and objective knowledge in evaluating this problem is emphasized and the semantic difficulties between various countries in the usage of the term "psychopath" is noted. Part of our difficulty in evaluating this problem is caused by the fact that it involves our moral customs, be-





of their having been psychoanalyzed. The use of licensed hostels for delinquents on parole is considered efficacious.

A bibliography is included. This book represents an intensive review of the viewpoints of many authorities in this increasingly important field and is recommended to all those dealing directly or indirectly with this problem. —*Commander C. H. Bagenstae, MC, U. S. N.*

*Handbook of Diagnosis and Treatment of Venereal Diseases* by A. E. W. McLachlan, M.B. Ch.B. (Edin.), D.P.H. F.R.S. (Edin.), Consultant in Venereal Disease, Bristol Clinical Area; Lecturer in Venereal Diseases, University of Bristol; Honorary Consultant in Venereal Diseases, Bristol General Hospital, formerly Clinical Medical Officer, Joint Committee Clinic, Newcastle General Hospital, Newcastle upon Tyne; Lecturer in Venereal Diseases, King's College University of Durham; Assistant Medical Officer, Venereal Diseases Department, West London Hospital, Clinical Tutor in Venereal Disease, University of Edinburgh, et al. 4th edition. 368 pages with 160 illustrations, 20 in color. The William and Wilkins Co., Baltimore Md. publishers 1951. Price \$4.50.

The first 10 chapters of this well written handbook are devoted to the diagnosis and treatment of syphilis. The pictures are excellent. Although discussion must be limited in a book of this kind, the author calls attention to the most important aspects of this disease. Under treatment, great importance is placed on the use of penicillin in conjunction with arsenicals and heavy metal therapy. No reference is made to published results of research as to the efficacy of penicillin alone in comparison to the additional use of an arsenical. The public health importance of contact investigation and case finding is not discussed. This is now considered an important part of the management of syphilitic patients because it is considered the duty of the doctor who diagnoses and treats syphilis to assist in stopping the spread of this disease in the community as well as in preventing reinfection of the patient by the infected sexual partners.

The discussion of the diagnosis of syphilis based solely on repeated positive serologic tests is too general to be of much assistance on this most perplexing diagnostic problem. The expected serologic response following treatment of syphilis and the management of seroreistant patients could profitably be expanded in this handbook.

Eight chapters are devoted to gonorrhea in both sexes. Since the advent of penicillin therapy the complications of gonorrhea have ceased to be of prime importance and a detailed discussion of examination and treatment would not be appropriate to a handbook. The effect of infection following treatment of gonorrhea with penicillin is not considered in the proposed follow-up period for proof of cure. This long period of follow-up seems unnecessary and of no value. No comment is made on the importance of the simultaneous treatment of known sexual partners to prevent 'ping pong' infection or on epidemiologic investigations.

The chapter on urethroscopy seems to be more appropriate for the specialist than for the general practitioner. With the recent advances in research with the newer drugs in the treatment of venereal diseases the current literature is of the utmost value to the doctor. These diseases and should be employed by him for guidance. A book written today should call this fact to the physician's attention. This book is a valuable guide particularly in the diagnosis of these diseases. Because of different concepts on the general practitioner's public health responsibilities in European countries and the United States, it falls short of meeting the requirements of this country from the public health point of view. — Commander L. E. Hedgecock MC U.S.A.

*Medical Psychology: A Basis for Psychiatry and Clinical Psychology* by G. K. Yacovynski, Ph.D. Associate Professor of Nervous and Mental Diseases, Northwestern University Medical School. 535 pages illustrated. The Ronald Press Co., New York, N.Y. publishers 1951. Price \$6.

This text has the purpose of presenting an integrated approach to the understanding of human behavior as a foundation for the study of psychiatry and clinical psychology. The method of presentation followed is to state only those theoretical constructs that have the widest acceptance and to give the experimental and clinical evidence from which they are derived. The book is intended primarily for use in a first year course in psychiatry. Part 1 is devoted to a discussion of basic psychologic principles in the areas of biologic needs, emotions, learning, perception, motives, and adjustment to conflicts. Part 2 deals with inheritance and maturation. Part 3 covers the structure and structuralization of personality. The author regards himself as having endeavored to integrate the theoretical concepts of the behaviorist, Gestalt, and Freudian schools.

The purpose for which this book was written is indeed laudable. Students of medicine, psychiatry, and clinical psychology need fundamental training in the experimental approach to the understanding of human behavior. Systematic exposure to this influence should eradicate some of the mysticism with which contemporary clinical thought and practice abound.

Encouraged by the author's refreshing statement of intent, one might reasonably have expected a straightforward exposition, at the behavioral level, of the functional connections between stimulus and response components of psychologic events, augmented by a discussion of the observational methods by which such relationships have been established. This, after all, is the task of the psychologist. He works along a continuum of descriptiveness, the experimentalist at one end seeking the broad, general principles which apply to a universe of phenomena, the clinician at the other end seeking the intimate and particular explanatory details. In this presentation, however, the author appears to have confused the terms experimental and objective with biologic. The book turns out to be a frankly dogmatic attempt to force

concrete and specific behavioral phenomena into a biologic framework best signified, perhaps by the term "homeostasis." Subsidiary dogmata include the familiar notion that behavioral phenomena are somehow mediated through transformations which occur within the organism, principally in the nervous system. For example, these [past experiences] produce certain modifications in the nervous system, allowing learning to occur and perceptual processes to be established. Evidence for this assertion was apparently regarded as unnecessary; at least, the specific details were omitted. Later this theoretical position poses difficulties even for the author, who observes that "It is necessary to distinguish between a true depression, in which the physiological functions are hypofunctioning, and a pseudodepression in which the external behavior and demeanor of the individual display symptoms of depression but the physiological processes are normal or hyperfunctioning." What the harassed clinician can do about this unfortunate circumstance is not indicated.

Although the author's experimental evidence for broad correlations between concrete neurologic and psychologic events is slender and specific correlations are lacking, there are occasional bursts of elaboration and refinement on matters not so controversial. For example in a discussion of pH it is observed that "in neutral aqueous solutions there is always 1 gram of ionic hydrogen to 10,000,000 liters of water or the ratio is 1/10,000,000, or 0.000,000 1 or  $10^{-7}$ ."

Students trained in experimental psychology and scientific logic can probably distinguish, in most instances, between the factual and mythical pronouncements of the text. There are many commendable discussions of psychologic phenomena and their determinants but they are difficult to disentangle from the profusion of dogmatic underbrush. Although this text is not likely to accomplish what it intended with the classes of students to which it was directed, I agree with the author's contention that there is a need for an integrated approach to the understanding of human behavior as a foundation for the study of psychiatry and clinical psychology. —*Major R. B. Pava, U.S.A.F. (MSC)*

*Chronic Ulcerative Colitis (Thrombo-Ulcerative Colitis)*, by J. Arnold Bergen, M.D. Division of Medicine, Mayo Clinic, Rochester, Minn. Publication Number 101, American Lecture Series. A Monograph in American Lecture on Abdominal Viscera. 62 pages illustrated. Charles C. Thomas, Publisher, Springfield, Ill. 1951. Price \$2.

This monograph is clear and concise. Although the author, well known as an authority on this subject, rightfully allots most of the pages to the sections on diagnosis and treatment, the pathology and complications are adequately described. The optimism shown by Dr. Bergen makes this book worth any physician's time. He writes: "Probably no greater satisfaction can encompass an individual who is sick with uncontrollable bloody diarrhea and who is wasting away rapidly and idly than to find him lifted from the depths of despair to regain his normal

health, and to resume again the activities of his former life. Yet such is the satisfaction offered to most patients suffering from this malady when they are willing and able to follow a well ordered regimen of treatment and rehabilitation. Most military physicians will gain a new insight into the chronicity and disability of chronic ulcerative colitis through this book. Perhaps the prognosis of military patients with this condition would be improved if attempts were not made to return them to a duty status.—*Col. H. C. Gibson MC, U S A.*

**Radlographic Atlas of Skeletal Development of the Hand and Wrist** Based on the Brush Foundation Study of Human Growth and Development, initiated by T. Wingate Todd, M.B. Ch.B. F.R.C.S. Late Henry Wilson Pyle Professor of Anatomy in Western Reserve University School of Medicine. *William Walter Gendrich M.A. Ph.D.* Professor of Anatomy Stanford University School of Medicine; formerly Professor of Physical Anthropology and Anatomy and Director of the Brush Foundation Western Reserve University School of Medicine and *S. Idell Pyle M.S.* Research Associate Brush Foundation and Department of Anatomy Western Reserve University School of Medicine. 190 pages. Illustrated. Stanford University Press. Stanford, Calif. publishers 1950. Price \$10.

The assessment of the developmental status of children has long been a difficult problem. In 1937 Todd published his well known *Atlas of Skeletal Maturation of the Hand* as a basis for determining developmental status. The present volume is a revision of his *Atlas* following 6 years additional observation of a series of 1000 normal children. Slightly fewer standards are included, and the present study extends to the age of 18 years. The book has four parts. There is a discussion of the assessment of developmental status from hand films. This includes comparison with other methods of maturity evaluation, the relationship of skeletal and reproductive system development and the methods of assessing hand films and the normal deviations. Two parts are devoted to the male and female standards and finally there is diagrammatic portrayal of the maturity indicators of each set of bones and epiphyses. As a basis for study of the normal development this work is invaluable. In order to establish abnormality graphic variants from each age group are included. The practicing physician might well desire a more precise estimate of the absolute limits of normal for a specific case. This is not feasible for as the authors point out, the variability inherent in skeletal development limits the precision of the techniques designed to assess it. The hand film remains the best single indicator of developmental status.

—*Major L. H. Edelblute MC U S A.*

**The Physiology and Pathology of Hemostasis** by *Armand J. Quick, Ph.D. M.D.* Professor of Biochemistry Marquette University School of Medicine. 188 pages with 18 illustrations. L. E. & F. Bliger Philadelphia, Pa. publisher 1951. Price \$4.

The first part of this book presents (1) an explanation for hemostasis which is consistent with known physiologic and clinical observations this being quite different from the view of Petit that bleeding is con-

trolled by a clot which functions as a mechanical stopper; (2) a classification of hemorrhagic disease with highlights in their diagnosis and surgical management; and (3) a chapter on venous thrombosis including its cause its treatment, and the use of antithrombins and anticoagulants.

The author states that (1) less than 10 percent of the blood flow through skeletal muscle is under the control of the sympathetic nervous system (2) not more than 1 percent of the maximum potential blood flow is required to meet the metabolic needs of the skin, (3) plasma is far more valuable in combating hemophilic hemorrhage than whole blood; (4) hematuria appears to be the most common and earliest form of bleeding caused by dicumarol therapy (5) for surgical safety a prothrombin level of 40 percent or higher is required, and (6) in the diagnosis of hemorrhagic disease the only tests needed in the majority of instances are determination of the bleeding time prothrombin time and prothrombin consumption.

Part 2 is devoted to 21 laboratory determinations and their clinical uses. This book should be of great value to the internist and surgeon.

—Col. A. E. White, MC, U.S.A.

**Medical Neuropathology**, by L. Mark S. Brinker, M.D. Assistant Professor of Neuropathology and Assistant Professor of Neurology, University of Cincinnati College of Medicine. Attending Neurologist, Cincinnati General Hospital Cincinnati, Ohio. Consultant Neurologist, Veterans Administration Hospital Fort Thomas Ky., Consultant Neuropathologist, U.S. Public Health Service Lexington Ky. with foreword by Marvin A. Blumenfeld, M.D. Professor of Medicine, University of Cincinnati College of Medicine. Director of the Medical Department of the Cincinnati General Hospital Cincinnati, Ohio. 372 pages. Illustrated. Charles C. Thomas, Publisher, Springfield, Ill. 1951. Price \$10.

This volume by the author of *Neurosurgical Pathology and Neuropathology in Its Clinicopathologic Aspects* deals with (1) the common nervous system complications of cardiac disease (2) functional and structural vascular syndromes, (3) chemotherapy and oxygen intoxication (4) polyneuritis and neuritis and (5) cerebral manifestations in blood dyscrasias lung diseases, arterial hypertension, and liver diseases. The author describes cerebral complications of the more common internal diseases correlating each type of cerebral lesion with its clinical counterpart. The chapter on cerebral manifestations in arterial hypertension is excellent as is the section on the Guillain-Barré syndrome. The gross and microscopic illustrations are exceptionally good.

—Lt. Comdr. W. H. Berwell, MC, U.S.N.

**Cornell Conferences on Therapy**, edited by Harry Gold, M.D. Managing Editor David P. Barr, M.D. Mark K. Calkins, M.D. Frank Glavin, M.D. Walter Modell, M.D. and George Rode, M.D. Vol. 4. 342 pages. The Macmillan Co., New York, N.Y., publisher. 1951. Price \$3.50.

This volume of the Cornell Conferences on Therapy should be of great interest to clinicians, interns and residents. The weekly conference

inaugurated at Cornell in 1937 are participated in by all departments of the Medical College and of the New York Hospital as well as by authorities from other institutions. The spontaneous informal and free discussion stimulates interest in rational therapeutics. The topics discussed are of wide general interest, the discussions are uniformly maintained on a high level, and there is a free exchange of thought wherein various authorities present and defend their ideas.

—Col. R. E. Blount, MC, U S A

*Hemodynamics in Failure of the Circulation* by W B Yarnes M.D. Ph.D. Professor of Physiology Department of Physiology University of Oregon Medical School Portland Oreg. and A.R. Hackman M.S. M.D. Research Assistant, Department of Physiology University of Oregon Medical School Portland Oreg. 71 pages, illustrated. Publication Number 88; American Lecture Series Charles C Thomas Publisher Springfield, Ill. 1951 Price \$2.75.

In this short monograph the authors clearly present their interpretation of circulatory failure a subject which has in the past few years produced expressions of many controversial views. Following their division of the subject into chronic congestive failure and venous congestion without failure they first briefly review certain basic physiologic principles. This is followed by a discussion of failure as caused by (1) failure of venous return and (2) failure of the ventricles. The remainder of the text is devoted to a discussion of chronic venous congestion without heart failure. Circulatory changes which occur in beriberi and in systemic arteriovenous fistula are used as examples. An excellent bibliography is appended, with a useful guide for selection of articles pertinent to various phases of the subject. The diagrams and schematic figures will prove useful to many though the text is lucid. The book is recommended to all physicians who wish access to further knowledge on this important subject.

—Col. J. S. Taylor MC, U S A

*Annual Review of Medicine* by Windsor C. Cutting, Editor Stanford University School of Medicine and Henry W. Newman, Associate Editor Stanford University School of Medicine Volume I. 484 pages. Annual Reviews Inc. Stanford, Calif. published 1950 Price \$6.

Twenty-eight contributors present the 22 subjects discussed in this volume. An extensive bibliography is given at the end of each chapter. In the preface the editors state that the more active fields of medicine will be reviewed annually while other sections will be reviewed only every 2 or 3 years. The chapter on infectious diseases contains a good discussion of hemolytic streptococcal infections. The section on diseases of the gastrointestinal tract devotes too much space to the surgical treatment of ulcers at the expense of discussion of medical aspects of these diseases. The chapter on medical aspects of cardiovascular disease is appropriately followed by one on surgery of the cardiovascular system. We have entered into a period of cardiovascular operations and although there is a relatively high mortality rate we can

expect fewer failure in the future. It behooves medical men in general to become acquainted with these operations. The chapter on diseases of the kidneys includes timely reviews on the various classes and phases of kidney disease and its related chemistry.

It was gratifying to find a chapter on nutrition in medicine in this review. It is quite impossible to practice medicine these days without increasing attention to the effects of overnutrition, malnutrition, and to the vitamin and electrolyte need of the body. It was equally gratifying to see the section on radiobiology in the service of medicine. This chapter reviewed briefly the effects of atom bomb explosion. Radioactivity is so new and so important in the history of medicine that all new developments in this field should be brought promptly to our attention. Under the heading "Annotated List of Review in Medicine"

provided an excellent, rather complete list of references to medical reviews appearing in the literature between July 1948 and November 1949. The review covers a wide variety of subjects related to infectious diseases, disease of the gastrointestinal tract, the cardiovascular system, hematology, nutrition, endocrinology, allergy, neoplastic diseases, respiratory diseases, the nervous system, and other matters. The chapters on diseases of the reproductive system, obstetrics, orthopedic surgery, and ear, nose and throat are improperly placed in a review of medicine. Enough excellent material is published in the fields of internal medicine to warrant a review in that field alone. The idea behind the Annual Review is good, but the value of the present volume lies mainly in the bibliography. — *Commander R. Volk, MC, U. S. N.*

**Current Therapy 1951: Latest Approved Methods of Treatment for the Practicing Physician**, edited by *Howard F. Conn, M.D.* Consulting Editors: *M. Edward Davis, Vincent J. Darbo, Garfield G. Duncan, Hugh J. Jewell, William J. Kerr, Perrin H. Long, H. Houston Merritt, Paul A. O'Leary, Walter L. Palmer, Robert A. Remann, Cyrus C. Sturgis, and Robert H. Williams.* 699 pages. W. B. Saunders Co., Philadelphia, Pa., publisher, 1951. Price \$10.

The appreciation of any book on therapy is a difficult problem, because of the basic individuality of every medical man in handling his patients. Although the understanding of the patient and his illness is the best guide to therapy, all medical men need a consulting guide, a basic standard, a reminder of details; there is where I find the value in *Current Therapy 1951*. Dr. Conn presents a method of treatment, carefully edited by himself and a group of consulting editors. A group of 275 contributors have collaborated in this book. Advances in medical science are rapid and variable, and in the field of therapy the changes are so striking that it is difficult for the average medical man to keep up with the literature. This book will help him. Like the previous editions it can be recommended to all practitioners of medicine as a reference book. — *LT. Col. J. R. VI ass, MC, U. S. A.*

*Pathology in General Surgery* by *Paul W. Schaeffer, M.D.* 400 pages illustrated.  
The University of Chicago Press Chicago Illinois 1950. Price \$17.50.

This book, written primarily for surgeons by a surgeon with extensive experience in pathology covers most of the more common conditions as well as many of those less frequently seen by the general surgeon. Each disease process is discussed in the text and illustrated by color reproductions of both gross and microscopic specimens as well as by roentgenograms in appropriate instances. Symptoms, signs and clinical findings are correlated with pathologic alterations. Not only is the end result of the disease presented but also the various stages in its development. Differences of opinion are presented in some instances. The discussion in the text is brief yet in most instances adequate. A selected bibliography follows each presentation. Special fields including genitourinary, gynecologic and orthopedic material are not presented.

The color reproductions are magnificent and the specimens used for illustration are well chosen. The book is clearly printed on good paper. A few typographic errors can be found. Although not all pathologists will agree with some of the interpretations made in the text and illustrations, the primary objective of the book to bring about a correlation of pathologic findings with clinical observations has been attained.

—Col. H. A. Van Aken, MC, U.S.A.

*Personnel Administration in Public Health Nursing*, by *William Brody*, Director of Personnel, New York City Department of Health, Lecturer in Public Health Administration, Johns Hopkins University, formerly Director of Personnel, National War Labor Board. 209 pages illustrated. The C. V. Mosby Co., St. Louis, Mo. published 1951. Price \$3.25.

Personnel administration as an applied science has grown rapidly in recent years and its need and importance in health organizations as well as in other social and industrial organizations cannot be minimized. It is by sound and progressive personnel policies that health organizations can attract and hold well qualified professional workers to carry out their objectives. In this book the author discusses briefly and simply the basic concepts and principles of personnel management as applied to the special problems encountered in public health nursing, though they may be applied to other fields as well. The first 10 chapters deal with the public health nurse and her position, classification and job description, recruitment and selection policies, orientation and professional growth through in-service education, working conditions including hours of duty, leaves of absence, salary and environmental conditions, service evaluations, promotions, discipline, morale and counseling, and retirement, transfers and dismissals. There is considerable discussion of the merit system in public service and the place and function of the central personnel agency because over three-fourths of the public health nurses are Government workers employed by agen-



cies either entirely or partly tax supported. Many of the principles of the merit system are also applicable to non-Government agencies.

In the last chapter the author emphasizes the need for more democratic and progressive personnel administration in the public health organizations specially because of certain factors characteristic of the organization and its personnel which have a tendency to hinder its progress. This is a well-written, easily readable volume which is valuable to the student, the public health nurse, and to any one associated with administration and personnel work not only in public health nursing but in related fields as well. Throughout the book many references are cited and there is an excellent bibliography and index at the end.—*Capt. A. E. Brimer U.S.A.P. (AFNC)*

The 1950 Year Book of Dermatology and Syphilology (December 1949–November 1950), edited by *Morton B. Sulzberger M.D.* Professor and Chairman, Department of Dermatology and Syphilology New York University Post-Graduate Medical School Director of Dermatology and Syphilology Skin and Cancer Unit and University Hospital New York University Bellevue Medical Center and *Rudolf L. Baer M.D.* Associate Professor of Clinical Dermatology and Syphilology New York University Post-Graduate Medical School, Associate Director Skin and Cancer Unit and Attending Dermatologist, New York University Hospital. 497 page illustrated. The Year Book Publishers Chicago Ill. publishers 1951 Price \$5.

This annual digest of dermatology and syphilology appears in a new and pleasant format. This year's introductory monograph is the treatment of pyodermas. The next 100 pages is devoted to a section on

Other equally readable sections are those on clinical contributions and current investigation. A large portion of the volume is devoted to the dermatologic application and use of ACTH, cortisone, other steroids, hormones, vitamins and antibiotics. To many of the abstracts are appended refreshing editorial comments that add greatly to a proper appraisal of the articles reported on. Although the Year Book is very helpful to those interested in dermatology and syphilology it also has great deal to offer any physician who wishes to keep abreast of this specialty.—*Capt. Robert L. Gilman, MC, U.S.N.*

Transactions of the American Gynecological Association 1950 Annual Session March 9-10-11 Shamrock Hotel Houston, Texas. 445 pages; Illustrated. Charles C Thomas Publisher Springfield, Ill. 1951 Price \$11.50.

This fine book is full of words of wisdom. It contains 32 articles grouped in 7 symposiums each of which is followed by a discussion printed in full and often quite valuable. The subjects of the symposiums are (1) diagnostic methods in the study of human thyroid disease (2) radiolodine treatment of hyperthyroidism, (3) toxic effect of radioactive iodine (4) the adrenals and thyroid disease (5) exophthalmos (6) cancer of the thyroid and (7) nontoxic goiter. Six papers deal primarily with operations on the thyroid. The remainder deal with medical or experimental approach to treatment.

Much of the material is of limited appeal and is over the heads of some educated in the pre-electronic age especially those with no taste for mathematics. Some articles however would delight and inform any physician. The book is authoritative. Several of the articles are exhaustive. In general the conservative opinions of outstanding men from well known clinics here and abroad are presented. A survey of the still unanswered question of the mechanism of exophthalmos is enlightening. Another stimulating article takes issue with the time-honored theory of iodine lack and goiter belts. Articles on the thyroid in farm animals, surgical decompression of the orbit for extreme exophthalmos, a family of cretins, and the prevention of asphyxia with bilateral vocal cord paralysis indicate the scope of subjects.

This is primarily a specialists' reference book. Twenty-seven of the articles have been previously published in the *Journal of Clinical Endocrinology*. —Commander M. M. McLean, MC, U.S.N.

*Administrative Medicine* by Haven Emerson, A.M., M.D. Editor, Professor Emeritus of Public Health, DeLamar Institute of Public Health College of Physicians and Surgeons, Columbia University. 1,007 pages, illustrated. Thomas Nelson & Sons, New York, N.Y., publishers, 1951. Price \$10.

More and more books on medical subjects are compilations of contributions from a panel of authorities, no one man wishing to pretend to a complete knowledge of even a relatively limited field. This volume is an encyclopedic work by 58 contributors. Although the editor contributes no chapter of his own, his name occurs in many of the selected lists of useful references which appear at the end of most of the chapters.

Part 1 on the organized care of the sick deals with various types of hospital, out-patient service and rehabilitation. Part 2 on the administration and economics of medical care deals with various Government medical services, university health services, various voluntary medical care plans for the general public and medical economics. Part 3 on public health administrative organization takes up official and voluntary health services from local rural through international organizations. Part 4 on the performance of public health services gets down to the administrative aspect of specific problems such as vital statistics, the control of various diseases, environmental sanitation, maternal and infant health, nutrition, health education, accident prevention, mental hygiene, and the training of public health personnel. The pages are printed in two columns to facilitate reading. Several of the longer chapters have a short summary.

It is unfortunate that there is no way to prevent specific cost figures from becoming rapidly obsolete. This applies especially to chapter 54 on the costs of public health services which was written in 1941. In a footnote the editor states his reasons for not bringing this chapter up to date. The chapter on medical service in the Armed Forces is likewise out of date. Among other things the complete separation of

the Air Force from the Army is not mentioned. The coverage for the Army is better than that for the Navy. Despite these minor and perhaps unavoidable defects this reference work will be of great aid to students, teachers, and administrators for many years to come.

—Col. W. G. Broadstadt, MC, U.S.A.

*The Neurosurgical Treatment of Traumatic Paraplegia*, by J. Lawrence Pool, M.D., Professor of Neurological Surgery, College of Physicians and Surgeons, Columbia University, New York, N.Y. Publication Number 83, American Literature Series. A Monograph in American Lectures in Surgery. 107 pages illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1951. Price \$3.

The diagnosis and treatment of spinal injury commonly seen in civilian practice is the theme of this publication. An attempt is made to discuss similar wounds of war. One chapter is devoted to classification of spinal injuries from the point of view of cause and of pathologic changes in the spinal cord and the skeleton. Another deals with the physiology of injury to the spinal cord. Following these two preparatory chapters the aspects of diagnosis and treatment are covered from first aid through rehabilitation. Illustrative case histories are included. This concise discussion of the treatment of traumatic paraplegia written by a neurologic surgeon should be of more value to general surgeons and those physicians who are occasionally concerned with this type of patient, than to neurosurgeons.

—Col. J. W. Kenbl, MC, U.S.A.

*A History of Nursing*, by Gladys S. Ilow, Ph.D., R.N., Chairman of Department of Sociology and Social Work, Rosary College, River Forest, Ill. formerly Director, Department of Nursing, The College of St. Catherine, St. Paul, Minn., formerly Visiting Professor of Nursing Education, The University of Maryland, Baltimore, Md. and C. J. Nues, Ph.D., Assistant Professor of Sociology, The Catholic University of America, Washington, D.C. 2d edition. 439 pages illustrated. The C. V. Mosby Co., St. Louis, Mo., publisher 1951. Price \$3.75.

The authors contend that nurses can gain insight into their own roles through the study of professional history in the light of social history. This brief history of nursing from early time to the present is interspersed with accounts of the progress of nursing as related to contemporary sociologic changes. The references given at the end of each chapter are mostly additional texts on nursing and sociology. Questions for study and discussion are also given at the conclusion of each chapter.—Lt. F. E. Quabbenau, MC, U.S.A.

*Handbook of Antibiotics* by A. L. Baron. 303 pages. Reinhold Publishing Corp., New York & N.Y. publishers 1950. Price \$6.50.

This volume opens with an introduction in which are explained, the scope and limitations of the book, the method of certifying antibiotics, and the selection and registration of trade-marks for antibiotics. This is followed by brief comments as to the production, chemistry, bacteri-

ology and pharmacology of 141 antibiotic. Each is followed by a bibliography. As a reference book this should be extremely valuable especially for specific clinical uses and the bibliography.

—Col. A. E. Whit, MC USA

**Perception—An Approach to Personality** by Robert R. Blake. Assistant Professor of Psychology, The University of Texas, and Glen V. Ramsey, Professor of Psychology, The University of Texas. A collaboration with Frank A. Beach, Urie Bronfenbrenner, Jerome S. Bruner, Norman Cawcutt, Wayne Dennis, Elsie Frank, I. Brunswick, Carl Rogers, Ernest R. Hilgar, George S. Klein, Alfred Korzybski, James G. Miller, Louis J. Mumford, and Clifford T. Morgan. 442 pages, illustrated. The Ronald Press Co., New York, N.Y. publishers 1951. Price \$6.

This book represents 13 papers which were delivered at the 1949-1950 Clinical Psychology Symposium held at the University of Texas. Each contributor is a recognized authority in his field. A rather novel approach to an understanding of personality and interpersonal relations has been attempted in this volume. Apparently diverse approaches such as the chapter by Dr. Beach on body chemistry and perception and the chapter by Dr. Dennis on cultural and developmental factors in perception are presented in an attempt to construct a comprehensive theory of personality. The authors have done a creditable job in editing this complex and diverse material and have fused the various papers into a harmonious whole enabling the reader to peruse the volume without the feeling of frustration which often accompanies the reading of a book containing a series of contributions from different authors.

—Lt. Col. C. S. Gersom, MSC, USA

**Maternal Care and Mental Health**, by John Bowlby, M.A., M.D., Consultant in Mental Health, World Health Organization, Director, Child Guidance Department, Tavistock Clinic, London. A report prepared on behalf of the World Health Organization as a contribution to the United Nations programme for the welfare of homeless children. 180 pages, 21 tables. World Health Organization, Palais des Nations, Geneva, Switzerland, publisher 1951. Price \$2.

The author prepared this exhaustive report for the World Health Organization as a contribution to the United Nations program for the welfare of homeless children throughout the world. In preparation for his study of the emotional needs of homeless children he visited extensively in Europe and America and studied the pertinent literature in each country. His bibliography consists of 159 references. He cites many specific examples of how independent research conducted in many countries has revealed the extensive and harmful consequences to the child's development of depriving him of maternal care at various periods of his early life. He emphasizes that even bad homes are often better than so-called good institutions or foster homes. Many different aspects of the subject are covered including comparisons of Rorschach responses of maternally deprived children, the influence on children of neurotic and psychopathic parents, behavior disorders in children, the illegitimate

child, the adopted child group care of deprived children, causes and prevention of family failure and a host of allied subjects. The book is very easy to read. All psychiatrists should acquaint themselves with this book. In addition there is valuable background and reference material for social workers, psychologists, sociologists and all those who are interested in work in the broad field of mental hygiene.

—Col. F. R. Drake, MC, U.S.A.

**Rice Dietary Control and Blood Pressure With Menus and Recipes** by *Fran L. Seymour, M.D.* 206 pages. Froben Press, Inc. New York, N.Y. publisher, 1951. Price \$2.95.

This comprehensive and interesting book is written by a doctor who is afflicted by arterial hypertension and considered her return to comfortable living the result of treatment on the rice diet as prescribed by Kempner. She wrote the book as a source of information as well as an inspiration for a more optimistic outlook on life even in those whomay consider themselves invalids. Much of the material is explanatory to the lay person but it is also helpful for the physician who is called on to treat hypertensive patients. In order to make the basic rice diet as enjoyable as possible sample menus are presented. The last half of the book is devoted entirely to recipes stressing low sodium content. These recipes show an excellent 'woman touch'. Modifications of the basic rice diet are offered for all patients—selected by their physician—who may tolerate certain additional items of diet. The book includes a chronologic outline story of the rice diet and tables giving the sodium and potassium analyses of foods as well as drinking water supplies of many parts of the United States.

—Col. U. R. Merikangas, MC, U.S.A.

**The Heart and Circulation** by *Paul Wood, O.B.E., M.D. (M.B. B.S.), F.R.C.P.* (London) Director Institute of Cardiology London. Physician National Heart Hospital. Physician in charge of the Cardiac Department, Brompton Hospital, Cardiologist, Rheumatic Fever Unit, Canadian Red Cross Memorial Hospital, Taplow. Late Consulting Cardiologist, Postgraduate Medical School of London, Hammersmith Hospital. 589 pages, illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers 1950. Price \$12.50.

The author's purpose 'to maintain balance between man and his instruments between experienced opinion and statistics between traditional view and heterodox between bedside medicine and special tests between the practical and the academic for graduates interested in cardiology has been magnificently accomplished in this book. It presents most balanced clinical approach to heart disease. All the modern physiologic concepts and the most recent developments of therapy and diagnostic methods have been clearly discussed. The author has included the current literature of both Great Britain and the United States in his references. Current information that is dispersed throughout a voluminous literature has been collected and emphasized in this treatise.

The title is somewhat misleading in that diseases of circulation here refers to those of the general circulation and not to peripheral vascular diseases. A noteworthy feature is the arrangement of electrocardiograms of various conditions about a triangle the apices of which represent the respective location of the standard limb leads. This novel method of presentation clearly demonstrates the significance and relation of the unipolar and chest leads. In numbering illustrations the book uses the chapter number and a serial subnumber.

The book is not a mere assemblage of facts and data but a well related study of each problem of cardiology. The author has placed the stamp of his individuality on the presentation. A few loose and inaccurate statements are scattered in the text, but do not detract from the merit of the book. Dr. Wood will undoubtedly correct these in future editions. —*Commander H. A. Lyons, MC, U.S.N.*

*The Contribution of Surgery to Preventive Medicine* by *St. James Learmonth, K.C.V.O. C.B.E. Ch.M. F.R.C.S.E.* Regl. Prof. of Clinical Surgery and Professor of Surgery University of Edinburgh. 55 p. George Oxford University Press. New York, N.Y. published 1951. Price \$2.50.

The contents of this book were drawn from a series of lectures known as the Heath Clark Lectures 1949 delivered at The London School of Hygiene and Tropical Medicine. The author draws attention to the fact that the practice of surgery in its special and general branches has contributed, and continues to contribute to the field of preventive medicine. The specific instances of such contributions are too numerous to be listed here. Special emphasis is placed on Bacon's list of scientific qualities. The author has linked these qualifications with John Hunter the great surgeon. I regret I had not the opportunity to hear these lectures as presented but the next best thing is being privileged to read them. —*Commander J. A. Murphy, MC, U.S.N.*

*Diabetes Mellitus Principles and Treatment*, by *Gurfil G. Duncan, M.D.* Clinical Professor of Medicine Jefferson Medical College Director of the Medical Division of the Pennsylvania Hospital and the Benjamin Franklin Clinic Philadelphia, with the collaboration of *Ferdinand Fetter, M.D.* Assistant Professor of Medicine University of Pennsylvania and *Associate Physician to the Pennsylvania Hospital, Perry S. MacNeal, M.D.* Associate in Medicine Jefferson Medical College Physician to the Pennsylvania Hospital and Associate in the Benjamin Franklin Clinic; *Barkley B. Idleman, M.D.* Assistant in Medicine Jefferson Medical College Research Fellow and Assistant Physician to the Outpatient Department, Pennsylvania Hospital and Associate in the Benjamin Franklin Clinic; and *Martha A. Hunsicker, B.S.* Director of the Food Clinic Pennsylvania Hospital. 289 p. ges., illustrated. W. B. Saunders Co., Philadelphia, Pa. publisher 1951.

Diabetes mellitus is a metabolic disorder which involves many fields of internal medicine as well as surgery. Dr. Duncan has provided a well ordered text covering all of the manifestations of this disease followed by notes on the recognition of the various complications and their treatment. He also has described the interrelationship of the pancreas

with the other organs and endocrine glands of the body. Liberal use is made of repetition for the purpose of amplifying the more important concepts principally that the overweight diabetic patient is usually refractory to insulin therapy and is more adequately controlled by reduction of weight. The problem of converting diet prescription to a menu is simplified and a detailed discussion of the food exchange system is given. Here he traces the increase in protein and carbohydrate in the diet at the expense of the fat content; the adequate control of the diabetes; and the value of instruction to the patient as means of avoiding or delaying subsequent complication. This book is well indexed and its presentation is on a very practical plane making it a valuable guide to any practitioner who does not manage diabetic problems as a specialty.—Lt. R. L. Fleck, MC, U.S.N.

*Patterns of Disease on Basis of Physiologic Pathology* by Frank L. Apperly, M.A., M.D. (Oxford), D.Sc. (M. I. Bourne), F.R.C.P. (London), Professor of Pathology, Medical College of Virginia, Richmond, Va. 456 pages, 50 figures and 37 charts. J. B. Lippincott Co., Philadelphia, Pa., publishers 1951.

As stated in his preface the author purports to trace disease processes from their inception through the progression of "biochemical change, altered function, altered anatomy and final cure or death," enumerating the compensatory mechanisms adopted by the body. By present-day standards he falls short of achieving this noble end. The book most closely resembles a compendium of lecture notes of great value, no doubt, to one who has attended the lectures, but representing only a bare outline of pathology and pathologic physiology to the casual reader. The presentation is orderly and systematic throughout but exceedingly elementary and dogmatic. The drawings are of value in depicting, broadly, disease patterns and the charts and tables serve as adequate summaries. No attempt is made to cover the morphology of disease in a manner to aid the physician at the autopsy table, microscope or in the clinical laboratory. No references to any of the basic literature are listed. The book would seem to be of greatest value to student nurses, medical technologists, and second-year medical students desirous of a quick review of basic principles prior to an examination in the didactic aspects of pathology.

—Lt. Col. F. A. Marx, MC, U.S.A.

*Roentgenology: Diagnosis of Diseases of Bones* by David G. Pugh, Assistant Professor of Radiology, Mayo Foundation Graduate School, University of Minnesota, Consultant, Section on Roentgenology, the Mayo Clinic. 316 pages illustrated. Thomas Nelson & Son, New York publishers, 1951.

This book consists of pages reprinted from Nelson's loose-leaf "Diagnostic Roentgenology." The pages are printed in two columns. Some of the illustrations are excellent and some are poor, but by and large they are useful. This book is designed to be a handy reference work and does not propose to deal exhaustively with the many subjects

discussed. It adequately reviews the broad field of diseases of bone and if more detailed discussion is desired reference may be made to the comprehensive bibliography included. The book is divided into sections on: (1) endocrine disturbances and allied disorders (2) dystrophies and dysplasias of bone and allied diseases (3) diseases of the hematopoietic and reticulo-endothelial systems (4) infections of bone (5) arthritis (6) osteochondrosis and aseptic necrosis of bone (7) bone tumors and (8) osseous manifestations of chemical intoxications.

—May J C Bates, M.C., U.S.A.

**Growth and Development of Children** by Ernest H. Waterson, M.D. Assistant Professor and George H. Lowrey, M.D. Instructor, Department of Pediatrics and Communicable Diseases, University of Michigan Medical School. 260 pages, illustrated. The Year Book Publishers, Inc. Chicago, Ill. publishers 1951. Price \$5.75.

The authors present a comprehensive review of growth and development from the fetal stage to adolescence. They bring together simply and clearly in a single small volume material which in most textbooks is sketchy and only superficially covered. This book discusses the following subjects: (1) heredity and environmental factors (2) fetal growth and development, (3) normal physical measurements (4) the premature child (5) behavior development, (6) organ development (7) osseous development, (8) role of endocrine glands in normal growth and development (9) energy metabolism, (10) nutrition in normal growth and (11) an outline of abnormal growth.—Lt. A. T. Henderson, M.C., U.S.A.

**Tuberculosis Among Children and Adults** by J. Arthur Myers, M.D., Ph.D., Physician in Charge, Chest Clinic, Students Health Service, University of Minnesota; Chief of Tuberculosis Service, Minneapolis General Hospital; Professor of Medicine, Preventive Medicine, and Public Health, Medical and Graduate Schools, University of Minnesota, Minneapolis, Minn., with an Introduction by Allen A. Kraus, M.D., Late Lecturer in Medicine, Johns Hopkins University; Past Editor, American Review of Tuberculosis, Baltimore, Md., with chapters by O. Theron Clagett, M.D., F.A.C.S., William S. Conklin, M.D., F.C.C.P., Jerome R. Head, M.D., F.A.C.S., Ralph C. Matson, M.D., F.A.C.P., F.A.C.S., F.C.C.P., John D. Steel, M.D., F.A.C.S. and C. A. Stewart, M.D., Ph.D. 3d edition. 894 pages, illustrated. Charles C. Thomas, Publisher, Springfield, Ill. 1951. Price \$12.50.

This book is dedicated "To the Memory of Francis E. Harrington, Charles A. Stewart and Herbert A. Burns with whom I labored for twenty-five years to establish fundamentals in tuberculosis control and eradication. All who know of the author's work will appreciate the appropriateness of this dedication. The third edition of this standard textbook brings up to date our information on tuberculosis control and clearly demonstrates that prevention of any form of tuberculosis is the best way to eradicate the disease. I recommend this book to all practitioners of medicine and especially to those working in tuberculosis control.—Lt. Col. J. R. Vvas, M.C., U.S.A.



**Medical Mycology** by Frederick Rei. R. M. Archibald, Rhoda W. Benham, Arturo L. Carrion, Amo Christie Norman F. Conant, Carroll W. Dodge, Lucill K. Georg, Henry Gougerot, Alexander M. Jam, Donald S. Martin, Morris Moore Samuel M. P. ck, William J. Robbins, S. B. Salvin, and Fred D. Weidman. Editor Roy Waldo Mueser; Associate Editor B. J. Henegau; Consulting Editor Frederik Rei. s. Volume 50 Art. 10. Pages 1209-1404. f Annals f The New York Academy f Sciences, Illustrated. The New York Academy f Sciences, New York, NY publisher 1950. Price \$2.75.

This monograph is a collection of articles presented before the New York Academy of Science in 1947. The authors of the individual papers are authorities in the field of medical mycology and as such present in concise form the best opinion on laboratory, clinical, epidemiologic and therapeutic procedures. Little new is added but the old is ably collected and clarified. Some provocative speculation as to susceptibility is presented by Dodge. The investigations into the nutrient requirements of various pathogenic fungi may open a new approach to therapy. The monograph is recommended to mycologists, dermatologists and clinical pathologists. —Col. V. R. Hirshman, MC, U.S.A.

**Yellow Fever** by Georg K. Strode, M.D., Editor and John C. Baglier, M.D., J. Austin Kerr, M.D., Hugh H. Smith, M.D., Kenneth C. Smithson, M.D., Richard M. Taylor, M.D., Max Theiler, M.R.C.S., L.R.C.P., Andrew J. Warren, M.D., and Loring Whitman, M.D. 710 pages. Illustrated. McGraw-Hill Book Co., Inc. New York, NY publisher 1951. Price \$9.50.

Dr. Strode and eight associates of the International Health Division of the Rockefeller Foundation have written and compiled a monumental textbook on yellow fever. It is well-illustrated and easily read. The average physician trained in the temperate zone is perhaps apt to feel that yellow fever is just another tropical disease and not his concern, especially since Walter Reed and his assistant solved the problem back in the early 1900's. Jungle yellow fever and *Haemagogus* mosquitoes are unknown to him and he has forgotten the potential danger of yellow jack wherever *Aedes* mosquitoes exist.

The book is not a textbook in the sense that it should be part of the required reading of medical students. Eighty-one pages are devoted to mammalian hosts, 65 to vectors and 93 to the virus itself. This illustrates the completeness with which the Foundation personnel have prepared this book. Certainly all teachers of preventive and tropical medicine, all reference libraries and those with special interest in the control of arthropod-borne diseases will find a wealth of material in it.

It has taken years of hard work, international cooperation, millions of dollars and many lives to prove that this scourge of the Tropics could be brought under control. The medical officer on duty with the Armed Forces does not need this book in his personal library but it should be available to him especially when he is on duty in a potential

yellow fever area. The chapters on epidemiology and control are excellent.—*Col. C. H. Mochouse U S A F (MC)*

**Handbook of Chemistry** A reference volume for all requiring data on chemical and physical data used in laboratory work and manufacturing. Compiled and edited by *Norbert Adolph Lang* Ph.D. Lecturer in Chemistry at Cleveland College of Western Reserve University Member of the American Chemical Society and American Institute of Chemical Engineers. Assisted by *Gordon M. Forker B.S. (Chem. Eng.) General Electric Company Cleveland, Ohio.* 7th edition 1920 pages Handbook Publishers Inc. Sandusky Ohio publishers 1949. Price \$7

This compilation of physical and chemical data on most common and many uncommon materials has been well printed on good paper and well bound for books of this type. It is fairly comprehensive but is not too bulky or unwieldy for convenient use at desk or work bench. Some mathematical tables have been eliminated in favor of new tables dealing with properties of hormones dipole moments dielectric constants and viscosities of aqueous sucrose and ethanol solutions. Other tables have been rewritten and brought up to date. Handbooks of this type are essential for the working scientist and for medical officers with laboratory interests. This edition recommends itself in encompassing an adequate coverage of material in a moderately sized volume.

—*Lt. Col. M. E. F. USAF USA*

**Medicine of the Year** Internal Medicine by *Hugh J. Morgan, M.D.* Professor of Medicine Vanderbilt University; Psychiatry by *Franklin G. Ebaugh, M.D.* Professor of Psychiatry University of Colorado; Obstetrics and Gynecology by *Frank Whitacre, M.D.* Professor of Obstetrics and Gynecology University of Tennessee; Pediatrics, by *Mitchell I. Rubin, M.D.,* Professor of Pediatrics University of Buffalo; General Surgery by *Warren H. Cole, M.D.* Professor of Surgery University of Illinois. 3d Issue. Editorial direction by *John R. Youmans, M.D.* Dean School of Medicine Vanderbilt University. 298 pages J. B. Lippincott Co. Philadelphia, Pa. publishers 1951. Price \$5

This is a well written summary of important developments in most fields of clinical medicine during 1950 presented in sections devoted to (1) internal medicine (2) psychiatry (3) obstetrics and gynecology (4) pediatrics and (5) general surgery. Subsections cover most of the remaining clinical specialties. Each subdivision is preceded by a short general description of its contents and is followed by a bibliography. The volume as a whole has an excellent subject index and an index of all the authors referred to in text or bibliography. The editorial staff includes some of the outstanding authorities in each of the fields covered. The advances, concepts and developments selected for review or comment are in general well chosen from the voluminous literature available and are documented by references to basic publications, most of which appeared in 1950. The book should serve as an invaluable aid to the physician who wishes to keep abreast of medicine in fields outside his own since the trends are presented in an informative and critical manner.

Because such a large amount of information is summarized in a very few pages it is inevitable that an occasional error will appear which if taken literally and without reference to the excellent bibliography provided might lead to embarrassing consequences. A case in point appears on page 189 where Rice et al. are quoted as recommending (for the maintenance of nutrition in debilitated patients) the intravenous administration of a solution containing 5 percent amino acids 5 percent glucose and 60 percent of 98 percent alcohol per 1 000 cc. A check with the original publication reveals that the solution recommended should contain 5 percent amino acids 5 percent dextrose and 60 cc. of 98 percent alcohol per 1 000 cc. In this edition the outside dimensions have been reduced from the 11¼ by 8¼ inches of the two preceding issues to 9¼ by 6½ inches and the number of pages increased from 204 to 298. The scope, volume and arrangement of contents remain much the same as before.—Col. A. A. Biederman, M.C., U.S.A.

**The Naval Officer's Manual, A Ready Reference of Hospital Information and Counsel for All Officers of the United States Navy and the Marine Corps.** 333 pages illustrated. The Military Service Publishing Co., Harrisburg, Pa., publishers, January 1951. Price \$3.50.

This book is completely up to date. It not only describes the organization of the Navy but also the interrelationships between the Navy and the other two branches of the Armed Forces which have resulted from the National Security Act of 1947. It is written primarily from the viewpoint of the line officer and has as its basic thesis the teamwork that is necessary for the Navy to carry out its mission as a combat organization. Such a book can be very useful to medical officers who in addition to their professional duties as physicians in a military organization, are constantly being confronted with problems of naval customs and traditions, uniform regulations, discipline, administration and the new code of justice. These matters are presented clearly and concisely.

The manual describes in detail the organization and responsibilities of the various departments aboard ship and in shore establishments, including the activities of the various naval schools for the training of officer and enlisted personnel. Much attention is given to public relations and public speaking. The chapter on personal matters is of particular importance to all officers having families. It discusses many problems that are constantly occurring, such as commissary and ship service privileges, transportation of dependents, shipment of household effects, allotment of pay, joint bank accounts, granting powers of attorney, will, hospitalization of dependents, the Navy Relief Society, insurance coverage and retirement procedures and privileges. The wives will be interested in the information on accepted social customs which has long characterized the high standard of naval life.

—Rear Adm. F. C. Graves, M.C., U.S.A.

**Blood Groups in Man** by *R. R. Race* Ph.D. (Cantab.) M.R.C.S. (England) Director Medical Research Council Blood Group Research Unit, Institute London, and *Ruth Sanger* Ph.D. (London) M.R.C.S. (England) Medical Research Council Blood Group Research Unit, Institute London with a foreword by *Professor R. A. Fisher* F.R.S. (London) Illustrated. Charles C Thomas Publisher Springfield Ill 1950 Pp 36.50.

This book is primarily a reference book for those interested in the technical field of blood groups. It is a well written detailed account of the progress made in this field, especially during the past 10 years. The authors discuss in detail the voluminous amount of investigative work from various research centers including their own. The bibliography is extensive. The authors bring up to date in one volume the present status of systems of blood groups including the more recent Rh and MN subdivisions and those of Lutheran Kell Lewis and Duffy. Discussions of special technics used in blood group investigations are presented. Difficulties encountered and pitfalls to be aware of in developing and using some of the serum containing antibodies are pointed out. The authors stress the hereditary factor found in the blood groups. The average busy practitioner would find this book too detailed and of little clinical interest but the authors promise to publish a book devoted to the clinical application of the blood groups later. The present volume will be of particular value to physicians concerned in certain medicolegal cases. One chapter is specifically devoted to the problems of parentage and identity. Several excellent charts outlining possible combinations and the problem of exclusion of paternity are included.

—Lt. Col D. O. Lyon M.C. U.S.A.

**Ambulation Physical Rehabilitation for Crutch Walker** by *Kenneth A. Denning* B.S. M. Ed. and *Frank S. Deyo* J. B.S. Instructor-Supervisors Corrective Therapy Cushing Veteran Administration Hospital Framingham, Corrective Therapists at Boston City Hospital, Boston and Medford Ambulation Clinic at Medford in Massachusetts and *Alfred B. Ellison* B.S., Chief Corrective Therapy Cushing Veteran Administration Hospital Framingham Corrective Therapist at Boston City Hospital, Boston and Medford Ambulation Clinic at Medford in Massachusetts 188 page Illustrated. Funk and Wagnall Co. New York, N.Y. publisher, 1951 Price \$3.50.

This small, well-organized volume presents a pictorial and word description of the basic technics to be used in a program of physical rehabilitation of paraparetics and paraplegics. The language is non-technical for the benefit of the patient and lay instructor. The material has been gathered from medical literature and clinical experience. The proposed procedures graduated from the simple to the complex have been proved by experience and have the sanction of long use. Emphasis throughout the text is on education in self-care and self-propelled locomotion as a means of acquiring some degree of independence in daily living. Though this manual has been prepared for the severely disabled

ed for those who are interested in the rehabilitation of such handicapped persons the methods and procedures are readily adaptable to less severe types of injury or disease in which crutches are required. This book, consequently, should be in the hands of every worker in the field of physical rehabilitation and also made available to those persons whose disabilities are sufficiently extensive to impose a prolonged period in a wheelchair or on crutches.—Lt. Col. J. B. Parson, U.S.A.F. (MSC)

*Syllabus of Human Neoplasms*, by R. M. Mulligan, M.D., Professor of Pathology in the University of Colorado School of Medicine. 317 pages with 250 illustrations. Lea & Febiger, Philadelphia, Pa. publisher 1951. Price \$7.50.

This book offers concise lucidly written and carefully edited descriptions covering most human neoplasms benign as well as malignant illustrated by numerous original well reproduced photomicrographs. The discussion of each neoplasm usually covers no more than  $\frac{1}{2}$  of a page yet includes a brief list of typical clinical findings unusually complete useful statistics as well as a clear and detailed description of gross and microscopic characteristics. The references are grouped after each chapter and do not intrude into the writing. Although the section on neoplasms of blood cell origin will certainly arouse the old arguments over terminology and interrelationships the chapter on neoplasms of female genitalia is especially well written. For its size this book is remarkably complete and well condensed. It should be particularly useful for quick reviews and in preparing for clinicopathologic conferences.—Lt. C. G. Bratenahl, MC, U.S.N.

*The 1950 Year Book of Pathology and Clinical Pathology* (January-December 1950). Pathology edited by Howard T. Kerner, M.D., LL.D., Medical Research Advisor to the Surgeon General, United States Navy; Clinical Pathology edited by Arthur Hawley Sanford, M.D., Professor of Clinical Pathology, University of Minnesota (The Mayo Foundation); Emeritus Consultant, Division of Clinical Laboratories, Mayo Clinic. 454 pages illustrated. The Year Book Publishers, Inc., Chicago, Ill. publisher 1951. Price \$5.

This book is composed of abstracted articles carefully selected from the world literature of 1950. Each phase of anatomic and clinical pathology is covered and the material is arranged in a manner similar to that found in most textbooks on these subjects. Many of the articles are selected from regional journals, foreign literature and other publications found only in large medical libraries and not readily available to most physicians. Frequent short comments by the editors are helpful in evaluating the material. The opening article is a summary by Selye on the present status of the adaptation syndrome. Several articles on endocrine glands are widely covered including many articles concerning the adrenal cortex. The chapter on cardiovascular pathology includes current investigations of the causes of arteriosclerosis. Several articles concerning lupus erythematosus and the L.E. cell are of special

interest. Studies on the effects of beryllium, new types of pneumoconiosis, streptomycin effects in tuberculosis, the coxsackie virus, and chemical tests for malignancy are included. There is a chapter on cytology. Many new, improved and simplified laboratory procedures are discussed giving the technique in detail. The Year Book Quiz is a valuable adjunct to the text. The book is highly recommended for physicians who desire to keep abreast of current developments in this important field of medicine. —*Lt. Comdr A. F. Bratt MC, U.S.N.*

*Post-Graduate Lectures on Orthopedic Diagnosis and Indications* by *Arthur Steindler M.D. F.A.C.S.* Professor of Orthopedic Surgery, State University of Iowa, Iowa City, Ia. Volume II, Section A, Paralytic Disabilities; Section B, Static Disabilities. 198 pages, illustrated. Charles C. Thomas, Publisher, Springfield, Ill. 1951. Price \$6.

This book is the second volume in a projected series of four. The first dealt with preliminary instruction in orthopedic diagnosis and congenital deformities. In the present volume Dr. Steindler outlines the most important orthopedic aspects of poliomyelitis (devoting almost one-third of the volume to this topic), scoliosis, spastic paralysis, low back pain, and static disabilities of the knee, foot and ankle. Each topic is carried from the basic considerations of anatomy, pathogenesis and pathology through clinical diagnosis to the nonoperative and operative treatment. The author indicates his own choice of treatment, the results of that treatment at his clinic, and often other accepted means of treatment. It is not possible in a volume of this size to cover these topics exhaustively, but the author has compressed into relatively small space a surprisingly comprehensive amount of basic information. He gives in didactic form the conclusions from his careful analysis of a vast clinical experience. The volume is especially recommended to the orthopedic resident and affords valuable reading to all interested in orthopedic subjects.

—*Lt. Comdr G. C. Beam MC, U.S.N.*

*A Textbook of X-ray Diagnosis*, by British Authors. 4 Volumes. Edited by *S. Cochrane Banks M.D. F.R.C.P. F.F.R.* Director, X-ray Diagnostic Department, University College Hospital, London, and *Peter Kerley M.D. F.R.C.P. F.F.R. D.M.R.E.* Director, X-ray Department, Westminster Hospital, Radiologist, Royal Chest Hospital, London. 2d edition. Volume II, 702 pages, 605 illustrations. W. B. Saunders Co., Philadelphia, Pa., publishers 1951. Price \$15.

This volume deals with the chest and replaces volume 1 of the first edition. The portion of the latter covering the chest contained 479 pages as compared with the present 702 pages giving some idea of the comprehensive nature of the new edition. Part I embraces the cardiovascular system, its greater scope being chiefly attributable to the advent of angiocardiology in the intervening 10 years. No illustrations of the normal angiocardigram are included and only a few angiocardigrams are presented in the chapter on congenital diseases of the heart.

and great vessels. A more inclusive clinical correlation would also have been a valuable addition. Semidiagrammatic colored drawings of the normal cardiovascular shadow in the various projections have been added which are helpful in correlating the normal anatomy with the radiologic appearance. Following a description of the normal cardiovascular shadow the diseases which involve the heart and great vessels are discussed in an easily read and adequate manner. The chapter on the peripheral vessels is the least comprehensive and little of practical value is included concerning venography.

Part 2 considers the respiratory system, and is fully illustrated. Greater and deserved emphasis has been placed on the bronchopulmonary segments as a consequence of the rapid advance in the realm of chest disease although the British terminology is used exclusively and no comparison is made with the method of Jackson and Huber more commonly used in this country. The normal anatomy of the respiratory system is well covered and is illustrated by line drawings. This is followed by a discussion of the various disease processes. There is a final brief chapter on the roentgenographic appearances of the lung following pneumothorax and surgical procedures.

The paper and binding are of excellent quality and the radiographic reproductions are uniformly excellent. The reproduction in the positive phase should only mildly disconcert the American reader.

—Lt. J. C. Bacon MC, U.S.N.

*Anesthesia in Dental Surgery* by Sterling V. Mead, D.D.S., M.S., B.S., F.A.C.D.  
2d edition. 648 pages with 212 illustrations. The C. V. Mosby Co.,  
St. Louis Mo., publisher 1931. Pp. \$12.50.

This book, the first edition of which was published in 1935, is an excellent addition to the dental and oral surgical practitioner's library. Although at times cursory in its presentation of the physiological aspects of anesthesia it elaborates on those particular segments most commonly used in dental anesthesia. It is divided into two portions. The first concerns primarily local anesthesia. Following the introductory pages which are devoted to an excellent discussion on the choice of anesthetic agents and the value of a thorough preanesthetic physical examination a review of related systemic pathology is presented. The historic discussion on the chronological development of local anesthesia which follows leads into a presentation on the related anatomical structures: osteologic, muscular, neurologic and vascular. The author then presents and elaborates on the pharmacology, armamentaria, technique of administration, accidents, complications and postoperative sequelae associated with local anesthesia.

In like manner the second portion deals with the many and varied aspects of general anesthesia. Following some interesting anecdotal on the historical background of general anesthesia a practical presentation on the physiology of general anesthesia is given followed by

section on preanesthetic medication. In the discussion on intravenous inhalation and rectal anesthesia particular attention is given to nitrous oxide sodium pentothal ethyl chloride vinylene and avertin. The concluding chapters which present the complications and untoward sequelae of general anesthesia the uses and abuses of the analeptic drugs and the various emergency measures and methods of resuscitation in anesthetic accidents should be of exceptional value to the dental anesthetist.—*May A. M. Mohr U.S.A.F. (DC)*

**The Kidney Medical and Surgical Diseases** by *Arthur C. Allen, M.D.* Pathologist, The James Ewing Hospital, Assistant Attending Pathologist, Memorial Cancer Center New York City Attending Consultant in Pathology, Veteran Administration Hospital, Bronx, N.Y. 583 pages, 1115 illustrations. Grun & Stratton New York N.Y. publisher 1951 Price \$15

This is an excellent treatise on the pathology and pathophysiology of the kidney. The illustrations are profuse and bring out many new concepts in the disease processes of the kidney. The book discusses the embryology anatomy normal and abnormal physiology of the kidney followed by a complete discussion of uremia. The diseases are presented by describing their effects on the glomeruli and various tubules. The illustrations although in black and white are well chosen and cover the subject. Glomerulonephritis its classification, pathology and physiology is well presented and illustrated. This might be described as an atlas of renal pathology correlating insofar as possible the disturbed physiology with the anatomic changes. The bibliography is extensive and up to date.—*L.L. Combs & W. W. Miller Jr. M.C. U.S.N.*

**Clinical Heart Disease** by *Samuel A. Levine M.D. F.A.C.P.* Clinical Professor of Medicine Harvard Medical School Physician the Peter Bent Brigham Hospital Boston, Consultant Cardiologist, Newton-Wellesley Hospital Physician New England Baptist Hospital. 4th edition. 556 pages illustrated. W. B. Saunders Co. Philadelphia, Pa. publisher 1951 Price \$7.75

This new edition brings up to date one of the foremost texts on heart disease. Through the years this book has become a standard reference work for students and clinicians. The new edition like the earlier ones stresses the clinical aspects of heart disease. It does not contain any bibliography because it generally expresses the personal opinions of the author. This does not detract from the book because Dr. Levine is an acknowledged authority an astute clinical observer and a master teacher. The book makes easy and enjoyable reading. There are no illustrations except in the section on electrocardiography. The greatest revision is found in the sections on the surgical treatment of mitral stenosis congenital heart disease and hypertension. The use of anticoagulants especially in myocardial infarction is also covered. The use of diets in the treatment of hypertension and congestive heart failure has been added. No mention is made of the use of ACTH and



cortisone in the treatment of acute rheumatic fever. The section on electrocardiography has been completely rewritten and greatly expanded. The use of multiple precordial leads and the new unipolar leads is adequately covered. Here again the emphasis is placed on the clinical aspects. —Col. E. M. Goyette, MC, U.S.A.

*Clinical Laboratory Methods*, by F. E. Bray, B.A., M.D. Professor of Clinical Pathology, University of Virginia, Director of Clinical Laboratories, University of Virginia Hospital. 4th edition. 614 p. pp.; with 119 text illustrations and 18 color plates. Th. C. V. M. by Co. St. Louis, Mo. publisher 1951. Price \$7.25.

This new edition of a well-known textbook includes the current trends in laboratory procedures. It is unfortunate that the role of the photoelectric colorimeter and spectrophotometer in the laboratory are only briefly mentioned and most of the blood chemistry determinations are based on visual colorimetry. A chapter which would be of great help to the busy clinician is devoted to selected laboratory work on special cases and on various services. Although the title gives the impression that the book deals with methodology alone, brief interpretations of findings are included. The format is good and the illustrations are excellent. —Commander V. E. Martens, MC, U.S.N.

*Emotional Factors in Cardiovascular Disease* by Edward Weiss, M.D. Professor of Clinical Medicine, Temple University School of Medicine, Philadelphia, Pa. Publication Number 97 American Lecture Series. A Monograph in American Lectures in Circulation. 84 p. pp. Charles C. Thomas Publisher, Springfield, Ill. 1951. Price \$2.25.

The author of this monograph discusses the psychosomatic aspects of (1) functional heart disease with its symptoms and treatment, (2) neurocirculatory asthenia, (3) hypertension and hypotension, and (4) psychosis in cardiac disease. He believes that cardiac neurosis arises in psychologically predisposed persons who have been subjected to a precipitating factor such as the statement of some physicians that the heart shows some abnormality, the occurrence of some dramatic case of heart disease among relatives or friends, some profound and protracted emotional disturbance or the appearance of some symptom which calls the patient's attention to his heart. The author emphasized the importance of explaining the illness to the patient. The format and binding are excellent. This monograph, apparently written for medical students and adds little to the knowledge of the general practitioner or internist.

—Col. F. H. Mowrey, MC, U.S.A.





# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
Agency Department of Defense*



WAYNE G. BRANDSTADT, Colonel MC, U S A., Editor-in-Chief  
ROBERT J. BENFORD, Colonel, U S A F (MC) Associate Editor  
HAROLD A. LYONS, Commander MC, U S N Associate Editor

THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY  
THE DIRECTOR OF THE BUREAU OF THE BUDGET OCT 19 1949

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON 1951

For sale by the Superintendent of Documents, U. S. Government Printing Office  
Washington 25, D. C.

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

The Chairman of the Armed Forces Medical Policy Council and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy and Air Force to submit manuscripts for publication in this JOURNAL.

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Contributions are to be the original work of the author. Quotations must be accurately and carefully copied and full credit must be given to the source. References tables (charts) and legends must be double-spaced and on separate sheets. References should be listed according to the Quarterly Cumulative Index Medicus, A. M. A., and the sequence should be as follows: name of the author and initials, title of article, name of periodical, volume number, pages, and month and year. *Example:* Hinton, D. and Steiner, C. A. Recurrent ulcers of sigmoid colon, unusual case report. Ann. Surg. 110: 147-149, July 1942. Authors are responsible for the accuracy of the bibliographic references.

The summary should be a factual and brief recapitulation of the observations or statements contained in the article. The conclusions drawn from the case, experiment, or facts set forth should be clearly stated and should appear at the close.

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WAYNE G. BRANDSTADT *Editor-in-Chief*  
*Colonel Medical Corps,*  
*United States Army*

ROBERT J. BENFORD *Associate Editor*  
*Colonel Medical Corps*  
*United States Army*

HAROLD A. LYONS *Associate Editor*  
*Commander Medical Corps*  
*United States Navy*

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OFFICE OF THE SECRETARY OF DEFENSE  
ARMY MEDICAL POLICY COUNCIL  
WASHINGTON 25, D. C.

Medical Personnel of the United States Armed Forces

Research in the Armed Forces combines all the investigative aspects of medicine. Its allied sciences contribute to the physical, mental, and psychological health and care of military personnel and to the integration of men and weapons into military units. The care of the wounded and the care of patients with conditions peculiar to combat require a great deal of clinical and basic research best done by those associated with combat situations.

Many problems such as frostbite and hepatitis require continued study. A splendid contribution to medical knowledge of vital importance to civilian and military physicians was the field research problem accomplished by the specially trained and selected Army Wound Ballistic Research Units attached to military hospitals in the Far East Command. Extensive data regarding the regional incidence of wounds and type of missile involved were obtained and the data disseminated through the Theatre Surgeon. Specific orientation of medical officers to the basic knowledge of wounds, classification of weapons and missile identification will be possible as a result of this study.

There are many other clinical research problems involving personnel and equipment that can be carried out only in combat areas. Here the line of demarcation between military and civilian medical research is sharp. The results of such research will have wide and often immediate application.

*W. Randolph Love, Jr.*

W. Randolph Love, Jr., M.D.  
Chairman

# UNITED STATES ARMED FORCES MEDICAL JOURNAL

Volume II

August 1951

Number 8

## Dr Meiling Awarded Certificate of Appreciation

ON 29 June 1951 the Secretary of Defense General Marshall presented the highest civilian honor of the Department of Defense—the Certificate of Appreciation—to Dr Richard L. Meiling whose resignation as Chairman of the Armed Forces Medical Policy Council became effective 30 June (fig. 1). Mrs. Meiling and ranking civilian and military officials of the Department of Defense witnessed the ceremony. The citation to accompany the award is shown in figure 2.

Dr. Meiling tendered his resignation as Chairman of the Armed Forces Medical Policy Council in order to return to his professional, clinical, and academic responsibilities. His leave of absence from Ohio State University College of Medicine expired on the effective date of his resignation from the Defense Department. In accepting Dr. Meiling's resignation General Marshall stated that he did so with regret, adding: "You have very ably discharged a difficult role in unification, in developing a coordinated medical program for the Army, Navy, and Air Force without loss of the individual medical service independence necessary to the combat mission of each service. I am most reluctant to release such a competent advisor and executive as you have proved to be."

Dr. W. Randolph Lovelace II succeeded Dr. Meiling as Chairman of the Armed Forces Medical Policy Council. A member of the Council during Dr. Meiling's tenure as Chairman, Dr. Lovelace was succeeded on 1 July by Dr. Alfred R. Shands, Jr., who with Dr. L. S. Rayden, Dr. J. P. Hollers, Dr. Lovelace, and the Surgeons General of the Army, Navy, and Air Force compose the Council.

Dr. Meiling's contributions toward effective mobilization of the nation's civilian health resources, as well as those of the Armed Forces



1 (top) —Dr. Weiling (center) receiving Department of Defense Certificate of Appreciation from Secretary Marshall, Deputy Secretary of Defense Lovett (standing at the left).

THE SECRETARY OF DEFENSE  
WASHINGTONCITATION TO ACCOMPANY THE AWARD OF THE  
DEPARTMENT OF DEFENSE  
CERTIFICATE OF APPRECIATION  
TO  
RICHARD L. MEILING

RICHARD L. MEILING for outstanding service performed for the Department of Defense and his country from November 1948 through June 30 1951. Appointed by the first Secretary of Defense in November 1948 to be a member of the Armed Forces Medical Advisory Committee Dr. Meiling served in this capacity until July 6 1949 when he was appointed Deputy Director of Medical Services. With the establishment of the Armed Forces Medical Policy Council on January 2 1951 Dr. Meiling was appointed the first Chairman of this Council.

Specifically responsible for coordination of the medical and health policies programs and affairs of the Department of Defense he has devoted himself tirelessly to the accomplishment of this mission. His ability to take the initiative on difficult and controversial matters and to carry these programs to a successful conclusion has contributed much to the unification of the medical services in the Department of Defense. His devotion to duty and his zeal for the national security have been outstanding.

In recognition of his service the Department of Defense awards to Richard L. Meiling its highest civilian honor the Department of Defense Certificate of Appreciation.



29 June 1951

Figure 2.

were lauded also in a resolution by the Health Resources Advisory Committee of the Office of Defense Mobilization. The resolution adopted 28 June said

Be it resolved that the Health Resources Advisory Committee of the Office of Defense Mobilization express its deep appreciation and gratitude to Dr. Richard L. Meiling, Chairman, Armed Forces Medical Policy Council for his splendid cooperation.

"Dr. Meiling's insight, ability and understanding of the implications of the mobilization of military medical manpower, supplies and facilities upon the Nation's civilian health resources have been a major factor in the Health Resources Advisory Committee's ability to meet its responsibilities. His tremendous contribution to the Nation's defense has not been limited to the Nation's military services but has contributed greatly to more effective mobilization of the Nation's civilian health resources during this period of emergency.

# Thoracic Injuries in World War II

## I General Considerations Alterations of Pulmonary Physiology and Therapy in the Initial and Reparative Phases (1)

Howard K. Gray *Captain, MC, U. S. N. R.* (2)

James D. Fryfogel *M. D.* (3)

THE opportunities presented during World War II for the treatment of thoracic injuries were without parallel in medical history. The literature of the past 5 years is replete with reports from the many small installations, field hospitals, and thoracic centers of all the allied armed services. In most instances, these reports concern the patients treated by the group reporting, the success of the methods used, and the mortality and rehabilitation statistics. More specifically, they cover first-aid measures, treatment of shock and other early complications, emergency procedures, the problem of foreign bodies within the thorax and in the thoracic wall, reconstructive surgery, and the definitive treatment of late complications and conditions. This accurate reporting of results and methods by a large group of conscientious physicians who in many instances were working under extremely difficult and hazardous conditions has furnished a wealth of pertinent information which is of inestimable value in the ever-expanding field of thoracic surgery.

Many of the barriers that stayed the hand of the surgeons in World War I have been surmounted. Infections which killed more men than did bullets in the Civil War no longer were found to be the principal cause of death. A review of the many statistical surveys of casualties in World War II reveals that wounds of the thorax comprised about 6 percent of all war wounds. The total mortality rate for all war wounds averaged about 8 percent but wounds of the thorax accounted for over

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(1) Part II, Therapy in the Reparative Phase by Joseph P. O'Connor, Commander MC, U. S. N. R., will appear in the September issue of this journal; and Part III, The Surgical Treatment of Traumatic Lesions of the Intrathoracic Cardiovascular Structures, by Herbert D. Adams, Commander MC, U. S. N. R., in the October issue.

(2) Mayo Clinic, Rochester, Minn.

(3) Formerly Fellow in Surgery, Mayo Foundation, Rochester, Minn., now living in Detroit, Mich.

32 percent of this mortality. Thus it can be seen that although there was a relatively low incidence of thoracic wounds in relation to the size of the area exposed to trauma, there was an extremely high mortality rate in the group of those injured in this region.

Table 1 shows the mortality rate in patients with thoracic wound who were brought in for treatment in various wars prior to World War II. What the mortality rate would be for all persons with thoracic injury is not known because the nature and extent of the wound of many persons killed in combat could not be determined.

TABLE 1.—Mortality rate from thoracic wounds in wars prior to World War II

War	Mortality rate (percent)
Crimson	79.2
American Civil	62.6
France-Prussia	56.7
Spanish-American	24.5
Russo-Japanese	14.9
World War I	27.5
Sino-Japanese	14.8

In World War II, chemotherapy, clearer concepts of the abnormal physiologic processes associated with thoracic injury and a more audacious surgical treatment combined not only to preserve life but also to restore the patient with a once-fatal condition to normal or functionally nearly normal. The interval between injury and treatment, always a factor which, when prolonged, made surgical correction impossible, was greatly shortened by having at hand skilled hospital corpsmen and medical officers in the forward areas. Adequate and available materials for the immediate replacement of lost blood or plasma or both, accurate evaluation by front line medical officers as to the type of treatment indicated; and rapid transportation to a well-equipped hospital in which every known method of treatment could be prescribed were additional factors which contributed greatly to the lowered mortality rate and the shortened period of morbidity. With reference to thoracic injuries much credit should be given to the administrative plan of segregating such injuries in order that the exacting care and the diagnostic and therapeutic measures needed to achieve the best results be available.

We propose in this report to present a condensation of the recent literature to record in some detail the methods used in World War II with such gratifying results and to outline what we believe to be practical approach to the treatment of thoracic wounds. It is hoped that this presentation may furnish a working guide to medical personnel.

of the Armed Forces whose contact with such injuries may have been casual. Credit is given to authors for employment of various techniques but no attempt has been made to establish originality of methods.

Primarily we are concerned with three questions: (1) What conditions must we be prepared to treat? (2) When do we treat them? and (3) How do we treat them? Although answers to all three questions in an individual case must be modified by the location of the injured person and available personnel and equipment, all units must be prepared to treat shock, control hemorrhage, institute measures to combat infection and support respiratory function.

### CONDITIONS TO BE TREATED

**Shock.**—From the therapeutic viewpoint it is well to consider shock as occurring in two phases. The first is primary shock which immediately follows injury and has a nervous component in which the pain and the psychic factors of the trauma produce the syndrome by their action on the vascular system. The second phase is the secondary or surgical shock which occurs from 2 to 4 hours after severe tissue injury and is characterized clinically by a profound fall in blood pressure, pallor and coldness of the skin, sweating, rapid shallow breathing, a weak rapid pulse and other less obvious manifestations of circulatory collapse. Secondary shock has been attributed to a variety of conditions which include asphyxia, fat embolism of the higher centers, a toxic substance or substances released from the site of trauma and the loss of blood or plasma or both, from the circulation. Only the last theory has been supported completely by experimental investigation, so that fundamentally secondary shock now is accepted widely as being caused by an inadequate volume of circulating blood irrespective of the cause of this decreased volume which, if allowed to progress, may produce hypoxemia, anoxia and death. Nervous influences and toxic substances may be contributory causes.

The treatment of traumatic shock includes relief of pain, recognition and correction of the source of the lost fluid, restoration of the lost fluid, and protection of the patient from cold, anxiety and apprehension. In patients with thoracic injuries, restoration of normal cardiorespiratory physiologic processes in itself will greatly augment the abolition of shock. Agents such as posterior pituitary extract, which constrict the capillary bed, may be indicated owing to the puddling of blood at such sites. Agents such as epinephrine which constrict the arterioles usually are not indicated, because the arteriolar tone may be increased as a compensatory effort of the body to correct the hypotension. Any additional arteriolar tension will only increase the tendency to puddling in the capillary bed and thus reduce even further the amount of blood in actual circulation.

**Hemorrhage.**—The volume of blood in a man weighing 70 kg. is about 6,300 cc. When more than 30 percent of this volume is lost rapidly and



is not replaced immediately by transfusion, death usually occurs. The protective mechanisms which automatically come into action after hemorrhage are a fall in arterial blood pressure, clotting, increase in heart rate, increased respiration, arteriolar constriction, and redistribution of blood. The latter produces the pallor and coldness of the skin seen clinically as a result of the attempt on the part of the defensive mechanism to divert the available blood from the surface of the body to the more vulnerable and vital regions. Thus, in a patient who has experienced a marked loss of blood, the clinical findings are those of secondary or surgical shock.

We must realize, however, that there are several major differences that influence therapy in shock caused primarily by hemorrhage (whether apparent or hidden). Control of the bleeding and the immediate restoration of blood by transfusion will usually correct the abnormal state, elevate the blood pressure, and the improvement will be maintained. In shock caused primarily by trauma when actual loss of whole blood has not occurred, appreciable quantities, the beneficial effects of transfusion of whole blood are usually of short duration and the blood pressure may fall off to shock levels at the cessation of what should be adequate replacement. These phenomena are probably caused by hemodilution that occurs in massive hemorrhage in contrast to the hemoconcentration which is seen frequently in traumatic shock. In those persons who have sustained injury to the thoracic cage or its contents, bleeding from such vessels as the intercostal or internal mammary vessels and bleeding from hilar vessels must be controlled immediately. Bleeding from the parenchyma of the lung will be discussed under the section devoted to the physiology of the pleural space.

*Incision.*—For practical purposes all wounds of the chest must be considered to be potentially infected. Penetrating wounds usually are contaminated by the introduction of foreign bodies such as bullet, metallic fragments, clothing, dirt, or skin. Blast or crush injuries without penetration may result in infection of the pleural space by traumatic communication with the lung, bronchus, or esophagus and the subsequent release of the pathogens usually found in these structures. The empiric use of sulfonamides and antibiotics applied locally but preferably administered parenterally to insure a protective level in the blood has proved its effectiveness.

It should be recognized that the reports of cultures made from pleural contents are notoriously misleading as the infection frequently becomes localized in only a few sites within the pleural space. This has been proved at operation when successive negative cultures have been taken from various regions. Pathogenic organism may be latent in fibrin clot and need the needle that has been inserted to obtain material for bacteriologic study.

The bacterial flora of the bronchi and bronchioles is varied. No single organism appears to be responsible for the infectious processes usually observed. Those most commonly obtained on culture especially in cases of chronic infection, are alpha beta and gamma strains of hemolytic streptococci, *Staphylococcus aureus* and *Pseudomonas aeruginosa*. Less frequently found are *Escherichia coli*, *Aerobacter aerogenes* and *Proteus vulgaris*. Infections that go on to suppuration commonly contain anaerobic streptococci, fusiform bacilli and spirochetes (*Borrelia vincentii*).

The presence of these virulent pathogens plus the added contamination of the wounds by an endless variety of local organisms makes the institution of measures to combat infection mandatory at the earliest opportunity. The value of the sulfonamides and antibiotic substances in acute surgical infections is now well established. Adequate dosage at the onset may thwart the development of the more complicated mixed chronic infections that demand more specific therapy. Since wars of today are world wars in the geographic sense fungi and the organisms encountered in tropical diseases must be included in our bacteriologic thinking.

#### *Alterations in respiratory physiology*

1. Pneumothorax—In the normal adult "negative" pressure exists in the potential space between the visceral and parietal pleura. This so-called negative pressure has reference to the atmospheric pressure and varies with inspiration and expiration, the average variation between respiratory excursions being 4-5 mm. of mercury.

The thoracic cage from the first breath of life assumes a size greater than that of the lung which it contains. Thus in order that pleural surfaces may remain in apposition, which is the condition seen in normal persons, the lung must expand. Negative intrapleural pressure is of importance therefore because it maintains expansion of the lung and it promotes the return of venous blood to the heart. When either pleural surface is punctured, atmospheric air is permitted to enter the pleural space and a pneumothorax is said to exist. If there is no communication to the atmosphere except through the bronchial tree it is termed a closed pneumothorax. If an atmospheric communication exists through the chest wall it is termed an open pneumothorax.

Following the development of a closed pneumothorax several complicating phenomena may be observed. By forced expiratory effort against a closed or partially closed glottis (as in the act of coughing), air is forced through the aperture which communicates with the pleural space and the bronchus or one of the smaller bronchioles and tension develops within the pleural space which may be many times atmospheric pressure (fig. 1). Under these circumstances the lung on the affected side may be almost completely contracted and compressed and the mediastinal structures are forced toward the unaffected side.



Figure 2.—Tension pneumothorax on the right with retained fragments.

with partial compression of the lung on that side. The diaphragm is also displaced downward and acute dilatation of the stomach may occur (fig. 2). Swing of the mediastinal structures to be described subsequently is prevented by the tension within the pleural space.

Following open pneumothorax two serious complications occur: (1) the negative intrapleural pressure is lost thus permitting the lung to contract, and (2) varying degree of obstruction to the return of venous blood to the heart occurs. If the puncture of the chest wall is smaller than the opening of the glottis the intrabronchial air will continue to enter the lung; its partially contracted state and respiratory impairment will be minimal (fig. 3). Only partial contraction usually occurs on the affected side because insufficient time elapses for outside air to enter the pleural space through the small aperture in the chest wall before expiration forces it out. Tension pneumothorax will not develop under these circumstances because the tension within the pleural space cannot rise above atmospheric pressure except momentarily during forced expiration. The pumping action observed in closed pneumothorax is absent for there is no communication with the intrapulmonary air passages; consequently the only source of air is through

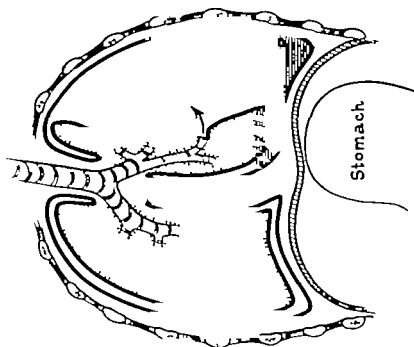


Figure 2.—Closed pneumothorax with tension.

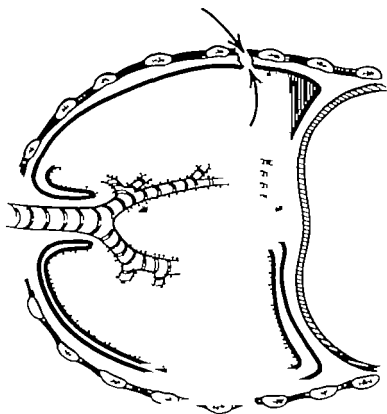


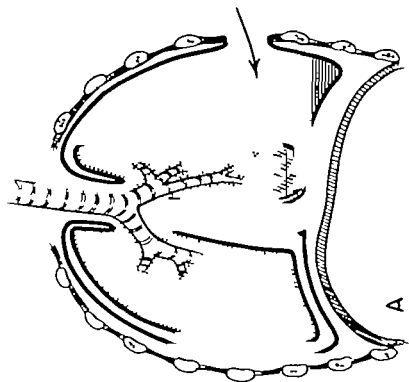
Figure 3.—Open pneumothorax with a small external opening.

the chest wall and pressure against a closed glottis does not add any more air to the pleural space than that which enters under ordinary atmospheric pressure. Almost complete contraction of the lung on the affected side may occur, however, owing to the obliteration of the negative pressure within the pleural space. Minimal swing of the mediastinal structures occurs under these circumstances but is not of such severe consequence as when the opening in the chest wall is large.

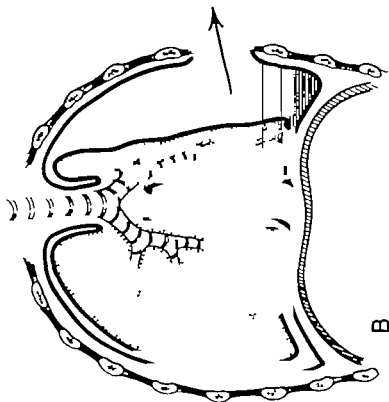
If the aperture in the chest wall is greater than the opening of the glottis the lung is contracted to a greater degree than when the traumatic aperture in the chest wall is small in diameter. On inspiration, the structures contained in the mediastinum are displaced toward the normally ventilating lung by the intruding air which is under atmospheric pressure and which enters the pleural space through the large aperture in an attempt to compensate for the increase of intrathoracic volume which occurs on inspiration. In this way the degree of expansion of the unaffected lung is diminished with a reduction of its functional volume (Fig. 4). This amounts practically to paradoxical respiration, but in this instance it is the mediastinum that is unstable. On expiration the reverse obtains and the mediastinum is drawn back toward the midline. This flutter or "swing" of the mediastinum greatly interferes with the return of venous blood to the heart by moderate angulation of the great vessels, especially the superior and inferior vena cavae. Because one of the major factors in the volume of cardiac output is the volume of cardiac intake or venous return, diminution of venous return is an extremely important step toward the failure of the circulation of an adequate quantity of blood. The chain of events resulting from a large open pneumothorax therefore may have a lethal outcome if these abnormal physiologic processes are not corrected rapidly.

In addition to the unique physiologic reactions which apply to thoracic injuries one must not lose sight of the fact that the usual factors involved in the production of shock are operative also for trauma of such magnitude as to produce a pneumothorax may be sufficient in itself to produce shock. A patient usually can tolerate a large open pneumothorax if the functional efficiency of the contralateral lung is not impaired by emphysema or inflammatory disease if the circulatory system is free of a disease process so that it can withstand the increased burden imposed by the physiologic loss of one lung and if the mediastinum is fixed so that the to-and-fro motion does not occur.

2. Stomach chest—In the crushed chest, a number of ribs may be fractured, usually in many places. A separation or dislocation of the costochondral or sternochondral articulations is frequently associated with the fractures. Such injuries destroy the rigidity of the chest wall which is vital to the maintenance of a satisfactory respira-



A



B

Figure 4.—Open pneumothorax with a large external opening (A) Inspiration. (B) Expiration.

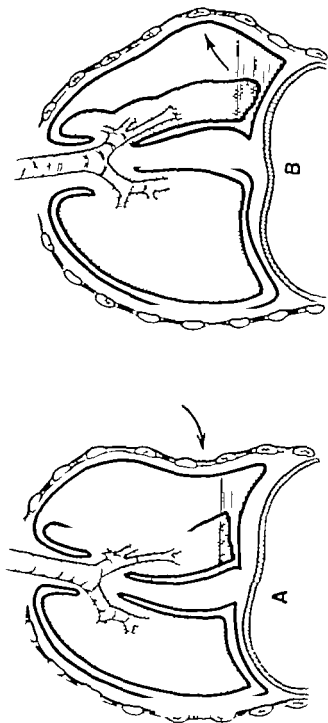


Figure 5.—Stimulus for paradoxical response (A) normal position (B) paradoxical response

tory exchange and produce what has been termed paradoxical respiration. Normal inspiration depends on an increase of intrathoracic volume produced by elevation of the anterior portion of the ribs and the descent of the diaphragm. With the production of increased volume air will enter the lungs under atmospheric pressure and will be extruded when the intrathoracic volume is reduced. If a portion of the chest wall has become detached from its bony structure the involved area becomes indrawn on inspiration and protrudes on expiration (fig 5)—a phenomenon which is just the reverse of that seen in normal respiration and one which may produce little or no change in intrathoracic volume so that air will not enter the respiratory passages on inspiration nor will it be extruded on expiration. Such a condition is incompatible with life and must be corrected immediately.

3 Hemothorax—The presence of varying amounts of blood in the pleural space is the rule and not the exception when thoracic injury has occurred. The source is as varied as the number of vessels contained in the chest wall or within the thoracic cage. Gross and progressive hemorrhage would indicate injury to the intercostal vessels.



Figure 6.—Acute hemopneumothorax on the left with a shift of the mediastinum to the right. There is diffuse trauma to the underlying lung.



the internal mammary or one of the larger vessels contained in the cardiorespiratory system whereas the clinical evidence of hemothorax which shows no sign of progress or shows very slow increase in volume would suggest that smaller vessels have been damaged and that the hemorrhage has been controlled spontaneously. The concomitant combination of blood, air and serous exudate which is poured out as a result of direct trauma to the serous surfaces and irritation by foreign material in the pleural space is seen frequently and demands recognition (fig. 6).

### WHEN TREATMENT IS TO BE GIVEN

The question of when to treat the various conditions is of the utmost importance. Although the management of thoracic injuries cannot be reduced to simple formula but must be governed by the presence or absence of various factors in the individual case it is well to have each member of the team aware of his facilities and capabilities. The team consists of all personnel who aid the patient from the time of injury until his final discharge from medical care.

Hospital couriers who see the patient first should be taught that sucking wounds should be closed immediately with dressing large enough to stop the sucking noise that stove-in chest should be bandaged snugly that the wounded man should be urged to cough if he has mucus in his throat and that he should be transported in a sitting position if he has difficulty in breathing when lying down.

When the patient is first seen by medical personnel a rapid clearing station accurate appraisal of the extent of injury is urgent. The physician's first concern in the seriously ill thoracic casualty is how best to prepare the patient for safe evacuation to a forward hospital or ship. Sampson et al. (4) have outlined the problem of immediate care of the wounded thorax. Dolley and Brewer (5), Sanger (6), Churchill (7), Kent and Tebrock (8) and others have described their method of management of acute and subacute thoracic wounds. From these and many other authors and from our own experiences a logical sequence of diagnostic method will be outlined in an attempt to answer when best and how to treat the casualty who has a seriously wounded chest.

**Early therapy—advanced areas**—Morphine should be administered for the relief of pain, and replacement therapy should be begun to assure adequate volume of circulating fluid. Plasma may be the only

(4) Sampson, P. C., Burkhardt, R., Brewer, L. A., III, and Burkhardt, T. H.: Immediate care of wounded thorax. *J. A. M. A.* 127: 606-610, Oct. 27, 1945.

(5) Dolley, F. S., and Brewer, L. A., III: Chest injuries. *Ann. Surg.* 116: 648-674, Nov. 1942.

(6) Sanger, P. W.: Evacuation hospital experience with war wound and injuries of chest, preliminary report. *Ann. Surg.* 122: 147-162, Aug., 1945.

(7) Churchill, L. D.: Surgical management of wounded. *Mediterranean theater of operations*. *Proc. Ann. Sur.* 170: 278-283, Sep. 1944.

(8) Kent, E. M., and Tebrock, H. E.: Pneuma-hemothorax management. *U. S. Navy M. Bull.* 4: 14-21, Jul. 1945.

substance available but no substitute is as effective as whole blood when loss of blood has occurred. The first aid measures instituted by hospital corpsmen should be checked. Open chest wounds must be sealed securely with petrolatum dressings; the stability of the chest wall insured by strapping; and an adequate airway realized by cleaning of the mouth and throat, including even the laryngeal area and upper part of the trachea if a suction apparatus has been improvised. Early and rapid evacuation of these patients is given a high priority but thought must be given to the problems of evacuation by air particularly if high altitudes are to be flown, because patients with respiratory embarrassment will not tolerate rarified atmosphere nor the increase in volume of a pneumothorax that occurs in direct proportion to the altitude attained.



Figure 7 a and b. Examples of blast injuries with focal destruction of the pulmonary tissue.

**Definitive therapy**—On his arrival at a hospital the patient's status must be re-evaluated without delay by means of physical examination, roentgenograms if his condition permits, and accurate estimation of the features of the thoracic wound. Immediate attention is given those patients who in spite of all the treatment that may have been instituted in the forward areas, present the problems of shock, sucking wounds, pain in the chest wall, anoxia, and mechanical difficulties in breathing. To determine those patients for whom immediate surgical treatment is mandatory, accurate diagnosis is essential. Most wounds are of two types: those resulting from penetrating fragments and those resulting from concussion or blast injuries (fig. 7).

In general it may be said of the second group that unless signs of continual blood loss, perforation of a viscus, or tamponade are present, surgical treatment should be delayed. Patients with pulmonary and cardiac contusion tolerate either anesthesia or surgical measures poorly. Several reports show clearly the value of withholding surgical

procedures in such circumstances in order that a reasonable diagnosis may be established to insure the patient's ability to withstand surgical treatment of such a serious nature.

In penetrating wounds on the chest is concerned with the extent of the injury and so must plot as accurately as possible the course of the missile. The possible deflection from bony surfaces, the failure to find a wound of exit and the position of the patient when struck must be considered in this regard. It is essential to determine if the injury is limited to the thorax or if structures within the abdomen or neck or both are involved also. In view of the fact that multiple wounds are seen so frequently it is essential that a complete examination be made in order that secondary wounds may not be overlooked when the focus of greatest interest is directed to the thoracic injury. The frequent diagnostic physical signs and symptoms are shown in table 2.

*General notes relating to diagnosis*—Physical signs and symptoms are treated in this outline because many of the patients when seen are too ill to tolerate other diagnostic procedures. The presence or absence of concomitant injuries of the abdomen or neck must be considered and sought for diligently. Abdominal rigidity occurring with a wound limited to the thorax is usually unilateral and on the side of the injury. The abdomen usually is somewhat flaccid on inspiration when no intra-abdominal injury is present. The simple expedient of blocking the thoracic nerves thereby enervating this portion of the abdominal wall may be of diagnostic aid. An abdomen that is silent on auscultation or the persistence of spasm of the abdominal muscle after nerve block indicates that intra-abdominal injury has occurred. Injury to structures in the neck is usually evident but one should examine carefully for emphysema of the mediastinum, neck, and chest wall, audible bruit, and sign of caval obstruction. The importance of accurately plotting the tract of the missile cannot be overemphasized since the data so obtained may be the deciding factor for or against immediate surgical intervention. If the patient's condition will permit the taking of roentgenograms, upright postero-anterior, upright lateral, and dorsal decubitus views of the chest, and flat plate of the abdomen should suffice for the primary examination.

### HOW TREATMENT IS TO BE GIVEN

The treatment of the thoracic casualty may be divided into three phases: (1) the initial or resuscitative phase; (2) the reparative phase; and (3) the reconstructive phase.

The methods of resuscitation as outlined by Samson et al. (4) adequately cover the major problems. Employment of these methods within the limit of personnel and equipment should be carried out by every group receiving a patient with early traumatic lesion.

TABLE 2 —*Diagnostic signs and symptoms of chest wounds*

- A. Thoracic concussion
  - 1 Shock
  - 2 Loss of consciousness
  - 3 Sighing respiration
  - 4 Cyanosis
- B. Traumatic asphyxia
  - 1 Deep violet-blue discoloration of the face, neck, and upper part of the thorax
  - 2 Edema especially of the lips and eyelids
  - 3 Skin dry and hot
  - 4 Stertorous respiration
  - 5 Visual disturbances
- C. Blast injuries
  - 1 Bulging chest
  - 2 Normal percussion note (early)
  - 3 Distant breath sounds
  - 4 Bloody froth from mouth and nose
  - 5 Shallow prolonged respirations
  - 6 Restlessness
  - 7 Rigidity and splinting of the abdominal muscles simulating sudden peritoneal contamination
- D. Pneumothorax (closed)
  - 1 Tympany on the affected side
  - 2 Tracheal deviation to the unaffected side
  - 3 Respiratory embarrassment with progressive cyanosis and increase of tension
  - 4 Distant breath sounds
  - 5 Shock
- E. Pneumothorax (open)
  - 1 Sucking wound
  - 2 Respiratory embarrassment and cyanosis
  - 3 Shock
- F. Hemothorax
  - 1 Tracheal deviation to the unaffected side
  - 2 Dullness on the affected side
  - 3 Absent or distant breath sounds
  - 4 Unrelenting shock if hemothorax is progressive
  - 5 Varying degrees of respiratory embarrassment with cyanosis
- G. Hemopneumothorax
  - 1 As in hemothorax
  - 2 Shifting dullness and tympany
  - 3 Respiratory embarrassment and cyanosis progressive if tension pneumothorax is present
  - 4 Shock
- H. Stove-in chest
  - 1 Pleurisy type of pain on respiration
  - 2 Paradoxical respiration
  - 3 Respiratory embarrassment and cyanosis
  - 4 Bony crepitation at site of fracture
  - 5 Shock
- I. Tracheal or bronchial obstruction
  - 1 Physical sign of atelectasis
  - 2 Dyspnea and cyanosis
  - 3 Cough
- J. Cardiac tamponade

See section devoted to cardiovascular injury Part III in this series to be published in October issue

## THERAPY IN THE INITIAL OR RESUSCITATIVE PHASE

The resuscitative triad as recommended by most observers includes in the order of their importance: (1) the restoration of cardiorespiratory balance by the stabilization of the thoracic cage, elimination of pain in the chest by blocking the appropriate intercostal nerves, tracheal aspiration of the "wet" lung, fixation of blood when hemothorax is present, water-seal drainage of tension pneumothorax, and the administration of oxygen for anoxia; (2) replacement of fluids, and (3) early control of infection. The immediate correction of the cardiorespiratory imbalance is the most important single factor in saving these patients. Although other resuscitative measures may be started simultaneously, the sealing of a sucking wound, return of the mediastinum to the midline by aspiration of pleural contents (air or fluid or both), establishment of an unobstructed airway, and the relief of pain should be the first considerations.

The extremely restless, apprehensive, and dyspneic patient is usually anoxic from loss of blood (either external or into the pleural space) and from his decreased vital capacity caused by compression of the lung by fluid or air or both and by atelectasis of the lung from blockage of the pulmonary radicles by excessive bronchopulmonary secretions. His efforts to rid himself of the burden to normal breathing are further hindered by the intense pain that accompanies every voluntary effort. Therefore his cough is feeble and ineffectual and the anoxia increases.

*Oxygen by nasal catheter.*—Oxygen may be administered by 12 to 18 F catheter which is attached to a portable oxygen tank. The flow should be 7 to 8 liters per minute. The apprehensive patient tolerates catheter much better than mask.

*Catheter aspiration of the trachea.*—In our experience this is best accomplished by use of flexible woven catheter with a thumb suction bulb. The catheter is passed under the directing forefinger into the larynx. This is done without anesthesia and the maneuver is facilitated if the patient's tongue can be pulled out with gauze square. If no ordinary rubber catheter is used it is best to clamp the tubing with hemostat thus preventing suction until the tip has been introduced into the trachea. While the initial aspiration may bring marked relief by the removal of blood and mucus, repeated aspirations are of value especially after nerve block when the inhibited cough of the patient proves to be of great assistance. The pulmonary damage after blast and concussion injuries may persist for a number of days. With subsidence of the shock syndrome bronchoscopy may be performed frequently twice a day if needed. Oxygen delivered at the rate of from 4 to 6 liters per minute under positive pressure by means of closed fitting mask is a desirable procedure. Until the tracheobronchial tree is free of secretion the administration of oxygen under positive pressure is of little benefit in the treatment of pulmonary edema.

*Regional nerve block.*—This procedure may be accomplished by the intradermal injection of a 1 percent solution of procaine over the angle of the involved rib or ribs including the two rib segments above and the two rib segments below the injury. Through these skin wheals a 2-inch 20 to 22 gage needle is introduced down to the body of the rib. The lower edge of the rib is found and from 5 to 8 cc. of a 1 percent solution of procaine are injected. The relief of pain is immediate and amazing. The patient is able to cough more effectively and to aerate the lung more efficiently. Regional block is preferred to injection into the site of the open wound because of the possible contamination. In nonpenetrating fractures of the ribs, injection of the resultant hematoma has given some relief. Strapping of fractured ribs as a means of affording relief from pain, is markedly inferior to the blocking of the appropriate nerve or nerves but is frequently used as an adjunct after blocking of the nerves has been accomplished.

*The use of morphine.*—Although this drug deserves its title as the doctor's best friend and pain's worst enemy. It must be administered cautiously to patients with thoracic injury. The recently wounded patient who is admitted to a hospital, usually will have had one or two injections of morphine to ease his pain when first seen and during transportation. This dosage (the exact amount should be determined, if possible), coupled with the inadequate circulation associated with shock is apt to show an accumulative effect during resuscitation and may depress the cough and respiratory apparatus the actuation of which one is attempting to achieve. The observations of Beecher (9) should be read by all who anticipate treating freshly wounded patients. Additional administration of morphine if indicated should be given intravenously in suitable doses to gain the response desired without prolonged effect.

*Stove in chest and sternal fractures.*—Treatment during the resuscitative phase is aimed at fixing the collapsed chest wall in a stable position. If the injury is unilateral this is best accomplished by wide adhesive strapping beginning at the bottom and working up. The patient is directed to lie on the affected side and sand bags are used to maintain this "fixed" state. If the condition is bilateral, or if there is sternal separation or fracture the chest wall may be suspended by towel-clip traction to the costal cartilages or to sternal screws that elevate and maintain their position from 2 to 4-pound traction over the pulley on an upright Balkan frame. Numerous ingenious measures for fixation have been described but most are not applicable at this stage of treatment. In most patients the use of the resuscitative measures outlined herein plus simple fixation, strapping and sand bagging will suffice. If it is necessary to transport a patient who is being treated by some form of traction the apparatus may be incorporated in a plaster cast which is applied around the thorax from the level of the suprasternal notch to the lowest portion of the thoracic cage.

(9) Beecher H. K. Some controversial matters of an anesthetic for thoracic surgery  
J Thorac Surg. 10: 207-219 Dec. 1940.

*Reduction in vital capacity*—The management of hemothorax pneumothorax or the two combined is the commonest problem confronting the admitting surgeon. It has been estimated that blood or air (usually both) will be present in the pleural space in about 70 percent of patients with injury to the thorax. A hemothorax must not be regarded as a simple hematoma but as a foreign body in a most vital space. The pleural cavity responds to this irritation by weeping serous fluid which increases the pleural mass.

The accepted treatment is removal of the fluid and air when present. The vital capacity of both lungs is markedly reduced. In the dyspneic patient with mediastinal shift, aspiration of the pleural contents is imperative. As much as 1,000 cc. of the bloody contents usually can be removed safely at one time if easily obtained. When the patient complains of tightness in the chest, a good stopping point has been reached. This symptom indicates that too rapid restoration of the negative pressure has been accomplished. The conservative management of hemothorax is a vague term and may be interpreted to mean anything from no treatment to occasional aspirations for relief of symptoms. An orderly plan of regular aspirations should be followed beginning within the first 24 hours after injury and continued daily until the pleural space is dry and the lungs completely re-expanded.

The question to be answered in this initial phase of treatment is: Has the bleeding stopped? If the injury is solely of lung parenchyma the compression of the lung by the fluid within the pleural space, the elevation of the diaphragm, and the low pressure within the pulmonary arteries combine to limit the hemorrhage. More than 1,500 cc. of blood from parenchymal injury alone is unusual. Secondary hemorrhage from pure rib injury is very rare. Bradford (10) found only 3 instances in 100 patients with hemothorax.

Bleeding from hilar vessels is usually fatal because the patient usually will die before receiving hospital care. Bleeding from the mammary or intercostal vessels is usually progressive. Besides the roentgenologic changes and the physical signs of the re-accumulation of blood within the pleural space the following criteria have been used as guides to detect continuous serious hemorrhage: (1) blood pressure which fails to rise with apparent adequate transfusion of blood (up to 2,000 cc.) or which, having risen to normal levels, falls again; (2) re-accumulation of from 1,500 to 2,000 cc. of blood in the pleural space within 24 hours after an initial aspiration of similar large amount; and (3) persistent severe anemia in spite of replacement of blood determined by serial hematocrit reading.

When the diagnosis of persistent serious hemorrhage has been made surgical intervention in order to control the bleeding is the only reasonable method of treatment. An added advantage to surgical intervention

is the opportunity to remove all foreign material within the pleural space and to perform a decortication of the clot that has become adherent to both pleural surfaces in particular to the visceral surface.

There is no evidence that early aspiration prolongs or brings about a recurrence of hemorrhage nor is there evidence that air replacement is helpful. In fact, evidence would condemn the procedure of air replacement because it is not necessary to arrest or prevent hemorrhage; it is desirable to evacuate air to restore pulmonary function by re-expansion of the lung, and should infection occur, there may be a total empyema if air is present, while there may be only a basilar empyema if there is a minimal amount of unexpanded lung.

### THERAPY IN THE REPARATIVE PHASE

In this phase of therapy a complete understanding of recognized surgical techniques as applied to the thorax, the preoperative use of resuscitative measures to insure that the patient will experience the least possible operative risk, and an adequately planned and supervised postoperative regimen are necessary. Duval et al. (11) reported from World War I a series of 3 000 patients received in ambulances and evacuation hospitals with penetrating wounds of the chest. The mortality rate was 30 percent in this group. As this does not include deaths at advanced stations or death occurring later in base hospitals a more accurate figure probably would be in excess of 50 percent. As contrasted to the above figure Nicholson and Scadding (12) reported a mortality rate of 4.27 percent in 1 639 patients with penetrating thoracic wounds in World War II. Johnson (13) reported a mortality rate of 7.4 percent in 308 similar cases.

Many factors have been responsible for this reduction of the mortality rate not the least of which have been adequate primary treatment early and rapid evacuation, more widespread familiarity with the significance of and the need for immediate correction of alterations in pulmonary physiology, the availability and early use of substances for blood replacement, the use of chemotherapeutic and antibiotic substances, and a more vigorous application of improved surgical techniques.

*Sucking wounds* which have been occluded temporarily by sealed dressings or by rough approximation of the edges of the wound should be repaired with the same precautions as given an intrapleural operation. Control of pulmonary pressures by intratracheal intubation should be instituted even though the procedure be performed under local infiltration anesthesia. With this safeguard to guarantee an adequate airway care may be taken to debride all devitalized tissues.

(11) Duval, P., Bastianelli, R., Gault, G. E., and Turner, G. G.: Symposium on surgical treatment of gunshot wounds (chest, Surg., Gynec. & Obst. 28: 1-28, Jan. 1919).

(12) Nicholson, V. F., and Scadding, J. G.: Penetrating wounds of chest; review of 291 cases in Middle East. *Lancet* 1: 299-303, Mar. 4, 1944.

(13) Johnson, J.: Battle wounds of thoracic cavity. *Ann. Surg.* 123: 321-342, Mar. 1946.



The wound of entrance of the missile may be small and apparently insignificant in appearance or may be a huge jagged wound. The wound of exit may be larger and more ragged. The tissue between the two wounds is usually markedly disrupted because of the sudden release of the kinetic energy contained within the missile. The destruction of tissue depends directly on the velocity of the missile at the moment of impact and the density of the tissue through which it passes. A missile may pass through parenchymal tissue of the lung with comparatively little damage whereas the same missile traveling with the same velocity would produce marked destruction should it strike a substance with greater density such as bone owing to the fact that destruction of tissue is commensurate with the rapidity with which the kinetic energy is dissipated. In addition to the original missile the fragments of bone will act as secondary missiles and produce additional damage.

Many have pointed out that traumatic wound of the cartilage require surgical excision to prevent serious infection. If there is parenchymal damage within the chest that requires extensive surgical treatment the site of trauma may be enlarged if exposure obtained in this manner is adequate. It is however unwise to work at a disadvantage and it is frequently more expedient to complete the airtight closure of the sucking wound and perform a secondary thoracotomy through a separate wound with resection of a rib. Deficient wound and suture or resection of the damaged lung removal of foreign bodies and splinters of bone repair of the diaphragm, evacuation of blood and clots, and irrigation of the pleural space may now be accomplished with maximal efficiency. Injury to pulmonary vein makes mandatory the removal of the lobe or lobes it drains. Extensive hematomas of a lobe must be viewed with suspicion as the future usefulness of that lobe. The lobe is vulnerable source of infection and the possibility of a potential traumatic arterio-venous fistula must be recognized.

The following points deserve attention: (1) the surgical closure of sucking wound must be airtight; (2) if the defect of the chest wall involves large loss of bony structure the insertion of a muscle flap to close this defect should be performed at the initial operation; (3) because of elasticity most authors believe that the parenchyma of the lung should be closed by interrupted sutures rather than by a single continuous suture; (4) positive pressure should be used to determine adequate expansion of the lung before closing; and (5) closed water can damage on suction with mild negative pressure should be instituted to aid in re-expanding the underlying lung.

*Continued bleeding*—If by using the criteria as outlined under resuscitative measure for continued hemorrhage it is decided that bleeding persists a thoracotomy should be performed. The source of the hemorrhage will usually be intercostal vessel, the zygos vein, the internal mammary artery, hilum vein, the diaphragm or viscera immediately beneath or from external pulmonary lacerations.

The management of hemothorax and its sequelae empyema or fibrinous pleuritis or both is a major problem in each phase of treatment. Extensive tissue damage plus bleeding combine to form fibrin clots. Thus the three immediate harmful effects—blood loss, pleural irritation and space occupancy in the chest, are manifest. For this reason, some authors have advocated early thoracotomy with evacuation of blood clot and fibrin. They believe that the simple removal of the foreign substance will produce a cessation of the bleeding by hastening re-expansion of the lung. The good results of repeated aspiration do not justify such radical surgical procedures in the acutely ill patient. Betts and Lees (14) have practiced ligation of the pleural space through simple perforating wounds with apparently a reduction in the number of posttraumatic aspirations.

Injuries to the mammary and intercostal arteries may be (1) false aneurysms with subpleural hematoma and infiltration with delayed secondary hemorrhage or (2) those associated with intrapleural laceration and continued intrapleural hemorrhage. In the first type isolation and ligation of the intercostal artery at points proximal and distal to the injury are needed for control of the hemorrhage as arterial pressure may be exerted in both directions. If the bleeding is thought to be caused by injury to the internal mammary vessels an anterior parasternal incision at the desired level will expose these vessels. Disarticulation of the costochondral cartilages may be performed if the primary exposure is inadequate. Injury to the vessels of the second type will be discussed in section III (October Issue) of this series. Open thoracotomy is necessary to correct bleeding from other sources.

*Thoraco-abdominal injuries.*—In combined thoraco-abdominal wounds the wound in the chest should be explored first because intensive abdominal exploration is poorly tolerated by the patient with cardio-respiratory imbalance and it may be possible to explore and repair the abdominal viscera through the diaphragm. Wounds of the superior surface of the liver are best repaired from the diaphragmatic side. The application of free muscle or fat grafts, suture or packing may be necessary to control hemorrhage from this organ. Extensive laceration requires abdominal exploration as well with drainage in order that bile peritonitis may be avoided as well as possible. Although fibrin foam was available in only small quantities toward the end of the war this substance is very useful.

Lacerations of the spleen through a rent in the left hemidiaphragm are satisfactorily managed from the thoracic approach. Enlargement of the diaphragmatic opening through its membranous portion and in a direction toward the esophageal hiatus will furnish adequate exposure for inspection and repair of the stomach or for resection of the spleen. By palpation through this opening the entire abdominal cavity includ-

(14) Betts, R. H., and Lees, W. M.: Military thoracic surgery in forward area. *J. Thoracic Surg.* 15: 44-63, Feb. 1946.

ing the pelvis may be explored manually but for obvious reasons this examination may prove to be inadequate. Because of the possibilities of multiple injuries to hollow viscera by concussion or by direct trauma from high-velocity missiles a more complete visual examination through an abdominal incision is recommended. The diaphragm should be sutured edge to edge with interrupted silk sutures or slightly overlapped. If there has been loss of substance of the diaphragm, the phrenic nerve may be crushed as it courses over the pericardium, the posterior lateral attachment of the diaphragm detached, the central defect of the diaphragm closed, and the posterior lateral edge of the diaphragm reattached to the intercostal muscles at a higher level. On the right side if a large defect is present, a similar procedure may be carried out or suture of the cut edges of the diaphragm to the capsule of the liver may serve as a temporary seal until the threat of infection is past. Then, if needed, a plastic repair with a fascial graft may be attempted.

*Hemothorax and infected hemothorax.*—Prior to World War II despite the teachings of some observers the accepted therapy as stated by Barrett (15) is indicated in the statement that the mere presence of hemothorax warrants neither operation nor aspiration. This now can be regarded as old fashioned for to neglect a hemothorax is to court trouble. Because the bloody effusion acts as a retained foreign body a series of pathologic changes occur. The fluid is pocketed by fibrin partitions and organization of the fibrin deposits on the pleural surfaces begins. This layer of organizing fibrin binds down the lung and prevents re-expansion so that the only manner in which the space originally occupied by the effusion can be healed is by contraction of the chest wall, elevation of the diaphragm, and retraction of the mediastinum. These deformities which are the usual end result of the untreated hemothorax produce all grades of disability from slight to crippling limitations of the cardiorespiratory function. The phenomenon that fibroblasts occur early in the investing layer of fibrin is the cardinal point in the pathologic changes that occur in hemothorax. Sampson et al (16) have given an excellent microscopic description of the peel. The term thickened pleura is a misnomer. The density seen radiographically is the investing layer of clotted blood and fibrin, the serosal surface of which is loosely adherent to the pleura. Treatment by a paracentesis should start within 24 hours. A delay of 5 or 6 days means increased difficulty in evacuating the cavity. Air replacement should not be used. The patient should be given sedative and adequate local infiltration should be made. If daily aspirations are needed, care should be taken to cause as little pain as possible as the cooperation of the patient is necessary. Aspiration should be high in the chest. Kent and Trock (8) have said that the lowest level of aspira-

(15) Barrett, M. R. Hemothorax: notes and observations. *Lancet* 1: 103-106, Jan. 27 1911.

(16) Sampson, P. C., Purford, T. H., Brewer, L. A., III, and Parke, L. R. Management of a wound of the middle center pole of the pulmonary decortication. *J. Thoracic Surg.* 15: 1-10, Feb. 1948.

dion should be the ninth interspace in the posterior axillary line the seventh interspace in the midaxillary line and the fifth interspace if aspiration is anterior Holman and Rogers (17) have expressed a preference for the second or third interspace anteriorly The rationale for this concept is the fact that the diaphragm is frequently elevated in hemothorax and most of the fluid portion is in the upper parts A 13- to 15-gage needle will be needed for some of the jellylike clots Persistence and patience are the watchwords for repeated aspirations should be made until the pleural space is dry until re-expansion of the lung is complete or until it is not possible to remove fluid even with a large-bore needle

*Decortication.*—Although not a new operative procedure decortication never was widely used until World War II It is indicated in patients in whom there is at least 30 percent persistent compression of the lung, especially if the apex is compressed, in spite of repeated aspirations or for whatever cause and in patients in whom primary aspiration has been unsuccessful

The optimal time for decortication is from 3 to 5 weeks after injury If performed less than 2 weeks after injury the peel is thin and friable The operation is tedious as the poorly defined membrane must be removed piecemeal or meticulously wiped from the pleural surfaces. When performed too late (from 10 to 14 weeks after injury) the fibrous union between the peel and pleura is often so firm that a proper cleavage plane cannot be established The visceral pleura is frequently torn and the lung does not expand readily because of fibrous ingrowths along the septa. The operation itself should be performed under intra-tracheal anesthesia through a thoracotomy wound of the surgeon's choice.

The parietal pleura and thickened peel is incised so that an opening is made into the "hollow" of the hemothorax. The liquefied contents clots pus and debris are evacuated. The peel covering the visceral pleura is incised and by careful dissection the proper cleavage plane between these two structures is entered. Finding this line of cleavage is essential to the success of the operation Two general methods are used (1) the visceral peel may be crosshatched and positive pressure applied to the lung by the anesthetist thus expanding the cross-hatched segments and causing their edges to curl at their junction with the visceral pleura so that the patches can be dissected away bluntly and (2) a single incision down to the visceral pleura may be made and by the use of gauze pushers or dissectors the peel may be freed in one piece

Regardless of the method used to initiate the operation, the salient feature to be accomplished is the complete release of the incarcerated

(17) Holman, E., and Rogers W. L. Laboratory course in thoracic surgery: exercises in performance of surgical procedures on thorax with discussion of their clinical applications. Arch. Surg. 49: 373-387 Dec. 1944.

lung from the enveloping fibrous membrane in order that complete re-expansion may occur. Particular attention should be directed to the costophrenic sulcus and the fissure of the lung as fixation at these sites prevents total expansion of the lung. The most difficult portion to free is the apex of the upper lobe and the dissection also must be carried well down to the mediastinal hilar attachments.

The visceral pleura beneath the peel is usually of normal consistency and is expansible when decortication is performed at the optimal time. Areas of atelectatic lung may be gently teased by the surgeon's hand as positive pressure through the intratracheal tube is gradually increased. Ballooning up of compressed lung to fill the thoracic cage completely so as to insure a satisfactory functional result is ample reward for exacting and meticulous dissection. Unless unusual adherence of the peel to the visceral pleura has occurred, tearing of or bleeding from the pleural surfaces is minimal. Closed water drainage with gentle negative pressure should follow decortication. The success of these methods in the reparative phase is attested to by the excellent mortality and morbidity figures that fill the literature.

# Electromyography

Arthur E. White *Colonel, MC U S A* (1)

James D. Amos, *Major MC, U S A* (1)

**I**NCREASING clinical interest in electromyography has developed during the past two decades. Electromyography is a direct application of electrophysiology to practical medicine (2). It has emerged as a diagnostic method with a high degree of accuracy and widespread clinical application (3). Earlier workers were hampered by inadequate electric potential recording devices (4), but the advent of the oscilloscope and electronic sound system now place the electromyograph (fig 1) alongside the electrocardiograph, the x ray and other accepted diagnostic instruments.

The card over the oscilloscope screen in figure 1 permits incorporating pertinent data on the same film which contains the wave pattern. This assures a permanent photographic record for future reference (especially in medicolegal cases). This card was developed by the authors. The drawer at the bottom of the machine contains the tape recorder for the playback of both the original auditory and visual muscle exploration.

Electromyography should be used as an aid to diagnosis only after full and careful clinical evaluation. Without a clear clinical picture in his mind, the physician may often find machines more misleading than useful in any branch of medicine (5). In addition, electromyography should be preceded by muscle testing with a suitable rectangular wave (electrodiagnostic) stimulator because a combination of the procedures gives a much more complete picture than either alone (2). The use of electromyography presupposes thorough training in the interpretation of data obtained from it; otherwise confusion would result when any but the most elementary action potentials are elicited. Jasper and Cone

(1) Letterman Army Hospital, San Francisco, Calif.

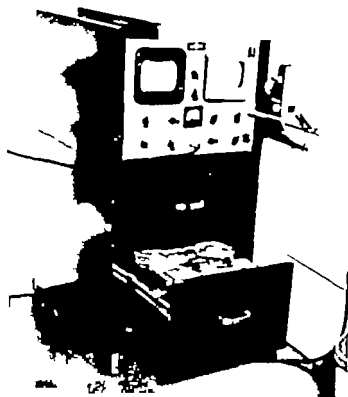
(2) Bauwens, P.: Electromyography. *Proc. Royal Soc. Med.* 41: 291-298, May 1948; *Br. J. Phys. Med.* 11, 130-136, Sept.-Oct. 1948.

(3) Shum, P. A., Woods, W. W., and Verden, D. H.: Electromyography in diagnosis of root compression syndrome. *Arch. Neurol. & Psychiat.* 64: 93-104, July 1950.

(4) L. Lessey, P. J. Flick, H., and Frank, S.: Contributions to clinical electromyography with case report. Guillain Barre syndrome. *Am. Pract.* 2: 396-399 Feb. 1948.

(5) Sargent, F.: Value of electromyography in clinical neurology. *Lancet* 1: 937-943, May 20, 1950.

(6) found that specially trained physicians using this instrument could diagnose nerve lesions with an accuracy of at least 90 percent as judged by comparison with operative findings and clinical follow-up studies



*Figure 1 —The electromyograph.*

In order to record and measure muscle voltages accurately it is necessary to elicit them from the muscle by means of an electrode which is either in contact with or near the muscle fibers. Monopolar electrodes of the lacquered needle type are highly satisfactory (6). A fine steel needle (fig. 2), insulated with vinylite except at the tip is used as the exploring electrode. It is inserted directly into the muscle being examined. Its only disadvantage is the pain caused by insertion of the needle through the skin, and this is minimal. The earlier workers in electromyography used percutaneous electrodes. Although these are

(6) Jasper, H. H., and Cox, W. V. Electromyography in peripheral nerve lesions. *Trans. Am. Neuro. Assoc.* 71: 49-52, 1946.

still being used in gross muscle studies (7,8) they have the disadvantage of not detecting the minute voltages effected by fibrillation

The electric potentials present in innervated and denervated muscle tissue are of minute microvoltages. These potentials must be amplified and projected in both a visual and auditory form. The oscilloscope and speaker attachment permit photographic records to be taken or a tape of both the auditory and visual impulses may be recorded. The advantage of the tape recording is that a record of a complete muscle exploration may be preserved and "played back" through the speaker and oscilloscope of the electromyograph at any time.

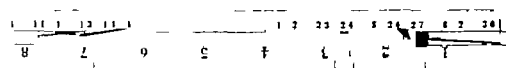


Figure 2.—Monopolar needle electrode.

### MUSCLE POTENTIALS

An understanding of the types of potentials seen in normal denervated and partially denervated or re-innervated muscle is necessary before the application of electromyography to clinical medicine can be discussed. In his description of electromotive forces Bauwens (9) stated that living tissue is the seat of electric polarization phenomena and that the polarization varies according to the state of the tissue. In the case of nerve and muscle fibers the polarization exists at rest, and is momentarily abolished during activity. This depolarization produces electric disturbances which are called action potentials.

When a muscle is examined with a needle electrode certain phenomena occur (fig. 3).

*Insertion potentials* (fig. 3a) resemble normal motor unit action potentials but can be distinguished from them by the mechanical method of their production (10). They consist of short outbursts of repetitive action potentials usually diphasic in character which are of lower amplitude and shorter duration than those of ordinary motor unit action potentials. The duration of insertion potentials was found to be 4 milli-

(7) Hamner, K. G.: Electromyographi studi i poliomyelitis. Arch. Phys. Therapy 23: 261-266, May 1942.

(8) Dawson, G. D., and Scott, J. W.: Recording of evoked potentials through skin in man. J. Neurol., Neurosurg. & Psychiat. 12: 259-267 No. 1949.

(9) Bauwens, P.: Electromyography in clinical medicine. Ed. J. Phys. Med. 10: 75-78, May-June 1947.

(10) Weddell, G.; Feinstein, B., and Pattle, R. E.: Electrical activity of voluntary muscle in man under normal and pathological conditions. Brain 67: 178-251, Sept. 1944.



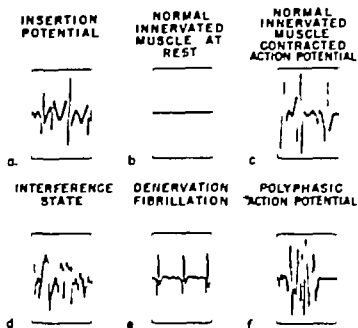


Figure 3.—The muscular action potentials as shown on the electromyogram.

seconds in the biceps muscle (11) with frequency of about 200 per second. They usually occur only during the actual movements of the needle but may last for a few seconds. This type of potential produces "knocking" sound in the loud speaker.

*Normal innervated muscle at rest* (fig. 3b).—After the needle electrode has been placed in position and the insertion potential has died out, there is complete electrical silence if the muscle has normal motor nerve innervation and is at rest (12-14).

*Normal innervated muscle when voluntarily contracted* (fig. 3c) give rise to repeated action potentials. They vary in frequency from 5 to 50 per second (11-15), in amplitude from 100 to 2,000 microvolts and in duration from 5 to 10 milliseconds. These variables depend on the ten-

(11) Kugelberg, E., and Peterson, L.: Insertion activity in electromyography with a steel electrode in and response to constant current. *J. Neurol., Neurosurg. & Psychiat.* 12: 268-273, Nov. 1949.

(12) Adams, E. D., and Basmak, D. V.: Discharge frequency in motor fibers frequency discharge in reflex and voluntary contraction. *J. Physiol.* 67: 119-131, Mar. 1929.

(13) Colzani, J. G., and Huddleston, G. L.: Electromyographic diagnosis of lower motor neuron disease. *Arch. Phys. Med.* 30: 495-500, Aug. 1949.

(14) Hofer, P. F. A., and Penman, T. J.: Action potential in scales in normal subjects. *Arch. Neurol. & Psychiat.* 42: 201-218, Aug. 1939.

(15) Weddell, G., Fawcett, R., and Peard, R. L.: Clinical application of electromyography. *Lancet* 1: 236-239, Feb. 20 1943.

sion of the muscle. The form of these waves is usually diphasic but may be monophasic or triphasic. A low-pitched thumping sound caused by the long duration is heard on the speaker.

*Normal innervated muscle when voluntarily contracted to its fullest capacity* (fig. 3d) exhibits what is known as interference state. The intensity of contraction increases with the increasing number of active motor units caused by increase of the impulse frequency from the anterior horn cells (5). The action potentials of neighboring motor units therefore interfere with each other.

*Denervated muscle* produces certain changes on the oscilloscope and from the speaker. If an electromyographic study is made within the first 16 to 21 days of denervation only insertion potentials are picked up; then there is electrical silence. After the first 16 to 21 days the insertion potentials are noted followed by fibrillation action potentials, otherwise known as denervation fibrillations (fig. 3e). When seen on the oscilloscope they are a series of repetitive spikes, mono- di- and occasionally triphasic, from 1 to 2 milliseconds in duration with amplitudes of from 10 to 100 microvolts and a frequency of from 2 to 50 per second. The repetitive nature is easily seen and may be timed. Fibrillations of two or more different amplitudes may be seen to follow in a regular rhythm and repeat themselves in that same rhythm, or two or more repetitive fibrillations may occur, each maintaining a separate rhythm and a different amplitude. These potentials are heard on the speaker as short clicks much higher pitched than the normal action potentials. Fibrillation, besides denoting denervation, tells us that the muscle fibers are still alive. For a muscle in which successive electromyograms show a gradual decrease in number and amplitude of fibrillations, one can give a poor prognosis. When a muscle is both denervated and electrically silent, it has undergone fibrosis (9).

*Muscles being re-innervated and muscles being affected by demyelinating disease* give another type of wave. This is important in differentiating neurologic conditions with the electromyograph and was first described by Weddell and his co-workers (15) as nascent motor unit potentials. These complex potentials are now called polyphasic action potentials (fig. 3f). These complex or polyphasic action potentials are seen in muscles which are being re-innervated and in muscles affected by demyelinating disease. They are also noted in degenerative diseases such as amyotrophic lateral sclerosis and progressive muscular atrophy (13).

Complex potentials are seen in re-innervating muscle long before any voluntary motion is possible (16). They are polyphasic waves having as many as 12 or more spikes, though early in re-innervation they may have only 2 or 3 spikes. Their amplitude is lower and their duration is shorter than that of normal motor unit potentials. This lower amplitude

(16) Barry C. M., Gurdless, H., and Hilsley J. C.: Electrical activity of regenerating axons. *in* *et. J. Neurophysiol.* 7: 103-115, Mar. 1944.



*Poliomyelitis*—Recent observations (20-23) have shown spontaneous discharges in anterior poliomyelitis to be a striking feature especially in the convalescent stage when they are a sign of improvement of muscular function. The completely paralyzed muscle is electrically silent except for fibrillations which develop from 16 to 21 days after the onset of poliomyelitis. Muscular spasm is absent during the time of development of paralysis in acute anterior poliomyelitis (24). There is an increase in irritability to stretching of muscles during the acute stage without any correlation to spasm tenderness or pain on stretching. The pattern of electric discharges produced by stretching resembles in appearance that obtained from muscles in a state of tonic contracture or spasm secondary to fracture of an extremity (21). Hansson and his collaborators (7) found a decrease in the amplitude and number of action potentials in muscles weakened by poliomyelitis. They also found this decrease to be almost proportional to the decrease in muscle power. On this data they offered a method of grading muscle strength with the electromyograph.

Huddleston and Golseth (20) found that there is a definite relationship between the finding of denervation fibrillations in a muscle paralyzed or weakened by poliomyelitis and its recovery. Fibrillation potentials are found in greater numbers in muscles of low strength than in those of greater strength. Conversely motor unit voltages are greater in stronger than in weaker muscles. Complete functional recovery has not been observed in muscles which exhibited fibrillations throughout their lengths from 21 to 40 days after the onset of poliomyelitis. They concluded that the data obtained electromyographically from paralyzed and paretic muscles is of prognostic and diagnostic significance.

*Spinal cord lesions including herniated nucleus pulposus.*—The level of lesions along the spinal cord have always been of importance to the neurosurgeon. Much interest has been evidenced lately in the localization of these lesions by the electromyograph (4, 22, 25-27). This method developed directly from the fact that compression or irritation of a

(20) Huddleston, O. L., and Golseth, J. G. Electromyographic study of paralyzed muscle in anterior poliomyelitis. Arch. Phys. Med. 29: 92-98, Feb. 1948.

(21) Watkins, A. L.; Brazier, M. A. B., and Schwab, R. S. Concepts in muscle dysfunction in poliomyelitis based on electromyographic studies. J. A. M. A. 123: 188-192, Sept. 23, 1944.

(22) Watkins, A. L. Electromyographic study in poliomyelitis. Journal Lancet 64: 235-236 July 1944.

(23) Brazier, M. A. B.; Watkins, A. L., and Schwab, R. S. Electromyographic studies of muscle dysfunction in infection polynuclear and poliomyelitis. New England J. Med. 230: 185-189 Feb. 17 1944.

(24) Pollack, L. J., Boshes, B., and Flakelman, I.; Absence of spasm during onset of paralysis in acute anterior poliomyelitis. Arch. Neurol. & Psychiat. 61: 288, 1949.

(25) Elliot, F. A. Tender muscles in sciatica; electromyographic studies. Lancet 1: 47-49, Jan. 8 1944.

(26) Hoefel, P. F. A., and Guttman, S. A. Electromyography—method for determining level of lesion in spinal cord. Arch. Neurol. & Psychiat. 51: 415-422, May 1944.

nerve root sets up fibrillation potentials which can be elicited in the corresponding muscle served by that nerve.

In anterior horn cell disease the voltage of the motor unit potential is almost invariably higher than that in cases of root compression. In addition, the voltage varies in a completely unpredictable way (27). Because anterior horn cell diseases such as progressive muscular atrophy and myotrophic lateral sclerosis frequently have only localized muscle atrophy it is of value to make an electromyographic survey of all patients with muscle atrophy if the cause is not clear because in this manner a general diffuse degenerative disease may be discovered.

When series of electromyograms taken from a patient with herniated disk are arranged according to segmental nerve supply it is a simple matter to determine the common nerve root of those muscles which show fibrillary activity and thus localize the lesion. This method does not specifically indicate a disk lesion but implies irritation of one of the nerve roots (22). This electromyographic method was found to be accurate in localizing the exact nerve roots involved in 68 of 75 patients (4) in one series in 17 of 24 (26) in another and in 10 of 10 (27) in a third series.

#### PRIMARY MUSCULAR DISORDERS

Although little difference is noted electromyographically between muscular dystrophies of the proximal and distal types the electromyogram in patients with primary muscular disorder as a whole has certain distinctive characteristics when compared with the normal electromyogram or with that observed in lower motor neuron disease. Kugelberg (28) has pointed out certain characteristics of muscular dystrophy to be uniformly present in both proximal and distal types. The distribution curve for the duration of the action potential is shifted toward the short side. The number of potentials with duration of 1 to 3 milliseconds is increased. The form of the action potentials is changed so that pathologic increases of polyphasic potentials which have a shorter duration than the action potential in the normal muscle is observed. A decrease in the amplitude is also evident. A decrease in number of action potentials occurs only in the later stages of the disease. Most of these electromyographic changes can be explained by the reduction in the number of muscle fibers in each motor unit. Thus as the number of muscle fibers is lessened, a small number contract asynchronously and the duration of the potential is lessened. This would also cause the increase in polycyclic potentials because a reduction in the number of muscle fibers would take out some of the intermediate phases thus causing an apparent splitting of the potential.

(27) Bennett, M. A. B., Weiss, A. L., and Michelson, J. J. Electromyography differential diagnosis of ruptured cervical disk. *Arch. Neurol. & Psychiat.* 56: 651-658, Dec. 1946.

(28) Kugelberg, E. Electromyography in muscular dystrophies. *J. Neurol. Neurosurg. & Psychiat.* 12: 129-136, 1949.

When this progresses as in advanced cases with few muscle fibers to each active motor unit the potentials appear as single oscillations. These single action potentials are caused either by the activity of a single fiber or by the more or less synchronous activity of a few fibers in the same motor unit (29).

This affords a simple aid to differential diagnosis of the chronic lower motor neuron diseases and the dystrophies because the former will show any combination of the following: spontaneous fibrillation, more marked insertion potentials, greater duration and amplitude of the action potentials, polyphasic potentials of longer duration than the action potentials in a normal muscle and finally the number of spikes is reduced in proportion to the diminution of the muscular force. These differences result from the fact that neurogenic disorders affect nerve fibers and thus whole motor units instead of primarily single muscle fibers and parts of units (28). Dystrophia myotonica gives essentially the same electromyographic findings as progressive muscular dystrophy (28, 29).

*Myasthenia gravis* also gives findings typical of those for muscular dystrophy. The electromyogram, in addition, shows the fatigue characteristic of the disease (30) and a decrease in spike amplitude on continued contraction (31). This is of value in following the progress of the disease.

*Paralysis agitans* cause rhythmic bursts of action potentials on the oscilloscope. If two antagonistic muscles are tested simultaneously these bursts may be seen to occur alternately in each muscle. These bursts of potentials occur at the rate of about six per second (32).

There are many other uses for electromyography such as kinesthetic studies of the upper extremity, the shoulder joint, the adductors of the hip and the trapezius (33-37). It is also of value in differentiating between organic and functional paralysis.

(29) Buchthal F., and Clemmensen, S.: On differentiation of muscle atrophy by electromyography. *Acta psychiat et neurol.* 16: 143-181, 1941.

(30) Weiss, A. L.: Electromyography in orthopaedics. *J. Bone Surg.* 31: 822-830 Oct. 1949.

(31) Lindaley D. B.: Electrical activity of human motor units during voluntary contraction. *Am. J. Physiol.* 114: 90-99 Dec. 1935.

(32) Schwab, R. S., and Cobb, S.: Simultaneous electromyogram and electroencephalogram in paralysis agitans. *J. Neurophysiol.* 2: 36-41, Jan. 1939.

(33) Bierman, W., and Yamashoe, L.: Electromyography in kinesiology evaluated. *Arch. Phys. Med.* 29: 206-211, Apr. 1948.

(34) Luman, V. T.; Saunders, J. B. deC. M.; and Abbott, L. C.: Observation on function of the shoulder joint. *J. Bone & Joint Surg.* 26: 130 Jan. 1944.

(35) Luman, V. T.: Functional aspect of abductor muscles of hip. *J. Bone & Joint Surg.* 29: 607-619 July 1947.

(36) Yamashoe, L. J., and Bierman, W.: Kinesiology of electromyography: trapezius. *Arch. Phys. Med.* 29: 647-651 Oct. 1948.

(37) Scherb, R., and Arienti, A.: Ist die Myoelektrographie als Untersuchungsmethode bei der zerebralen Paralyse? *Schweiz. med. Wochenschr.* 73: 1077-1079 Dec. 8, 1945.

## SUMMARY

Electromyography has become an accepted clinical diagnostic procedure of high accuracy. The electromyograph, using the monopolar needle electrode, permits excellent visual and auditory amplifications of muscle action potentials. The visual impulses seen on the oscilloscope may be photographed and both the visual and auditory amplifications may be recorded on tape for playback at any time. Electromyography is of value in detecting peripheral nerve injury, root compression syndrome, poliomyelitis, spinal cord lesions, primary muscular disorders, and differentiating organic and functional paralysis. The electromyograph may be used to determine the type of paralysis which is present, whether it is of muscular disease, a lower motor neuron disease, or a peripheral nerve lesion.

# Treatment of Frostbite of Toes

John B. Irwin, *Lieutenant, junior grade, MC, U. S. N. R.*  
Herbert Schultz, *Sergeant, U. S. A.*

THE project here reported was undertaken at the rear of the third battalion of the Fifteenth Infantry Regiment in Korea. A squad tent was made available for hospitalization of all the patients with frostbite in this battalion. One sergeant of the Medical Service did the daily dressings, kept the records and supervised the patients. The physician visited the patients every 2 or 3 days. The patients remained on the morning report of the battalion. The purposes of the undertaking were to (1) maintain battalion strength by not evacuating personnel thus losing them through their subsequent assignment to other units; (2) economize on transportation and save the time required for evacuation and reassignment; (3) discourage the suspected self-infliction of frostbite by those desiring evacuation to Japan; and (4) investigate rapid and practical methods of treating frostbite.

Numbness, pain and hyperhydrosis were not in themselves an indication for hospitalization or treatment according to our standards. Only those with blistering were hospitalized. For convenience the lesions were classified into three grades. In Grade I the blister extends down to but does not include the stratum germinativum. In Grade II the blister extends down through the stratum germinativum and the skin pattern is lost. In Grade III the blistering and necrosis extend through the dermis and involve the fatty tissues.

The routine treatment schedule established was as follows: (1) the feet were thoroughly washed with soap and lukewarm water; (2) the toes were painted with merthiolate; (3) the blistered and necrotic tissues were completely excised; (4) nails were clipped short or completely removed if the blister extended under the nail bed (no pain was encountered in this procedure because of the anesthesia present in frostbitten toes); (5) zinc oxide ointment was applied to all lesions; (6) zinc oxide ointment with 3,000 units of procaine penicillin per cc was applied if there was infection because in addition to its antiseptic action it afforded mild anesthesia to some painful toes (ointment with or without procaine penicillin usually relieved almost all pain and discomfort); (7) a plain gauze dressing was applied to each affected toe using sterile technic insofar as limited supplies and facilities permitted; (8) if the lesion was grade 2, 3 or infected, 300,000 units of



procaine penicillin were given parenterally each day and (9) all patients were allowed to walk at least to meals and the latrine. This reduced the nursing care required for each patient to a minimum, maintained good morale and probably aided circulation.

The daily care consisted of (1) redressing; (2) reapplication of ointment; (3) further excision of necrotic tissues as necessary; (4) giving aspirin to relieve the aching pain which almost always appeared in the toe when it started to heal; and (5) on the last 3 or 4 days of hospitalization, patients were sent on graded walks up to 3 or 4 miles in order to recondition them for duty. Also at this time they were put on short periods of guard duty to aid in the local security.

Many patients presented themselves shortly after the appearance of a blister, but others did not come until the blister was old, dried out, hard, purple and infected. The early treatment of these lesions halts the deeper extension of the necrotizing process. Marked improvement could be seen in the tissues after 1 or 2 days of treatment.

The only complication encountered was infection in the local necrotic tissues with almost complete absence of cellulitis. This was evidenced by seropurulent exudate frequently found in the older lesions when initial treatment was delayed. Infection occurred frequently in the Grade II and III lesions which usually were apparently sterile. This was probably caused by failure of sterile technique resulting from the limited supply of sterile dressings. The infection was mild and usually well controlled by procaine penicillin given parenterally and topically and daily lukewarm magnesium sulfate soaks.

The results obtained from the above method of treatment are shown in table 1. The occasional long periods in the hospital in Grade I patients were the result of infection which slowed the healing process. None of the patients regressed or failed to improve with the prescribed method of treatment. The end point of treatment was a well epithelialized surface which was usually dry and pink or had a small crust. Toes frequently were still somewhat numb or painful at the time of discharge.

TABLE 1.—Comparison of patients with three grades of frostbite

	Grade		
	I (12 patients)	II (4 patients)	III (4 patients)
Average number of days			
From frostbite to appearance of blister	3.7	2.3	3.3
Range	(1-7)	(2-3)	(2-4)
From frostbite to hospitalization	11.0	10.5	13.8
Range	(2-19)	(4-28)	(7-28)
In hospital	10.0	26.0	44.0
Range	(1-16)	(17-35)	(32-51)

The success of treatment in the rear hospital encouraged an attempt to treat frostbite while our infantrymen were carrying on their full duties in combat. Eleven such patients (8 Grade I and 3 Grade II) were so treated. The routine treatment schedule was followed as closely as possible. Of these patients the nail was removed from the second toe of one man and from the great toe of another man. An attempt was made to change the dressings daily but the tactical and topographic distribution of our troops occasionally necessitated an interval of 2 or 3 days between treatments. The change of dressings on the early morning sick call left each man available for full duty for the remainder of the day. There was a minimum of complaint of discomfort and there was no disability or interference with the performance of duty. All lesions healed *satisfactorily* though at a rate *somewhat slower than* that of those treated in the hospital. All patients were carefully instructed in foot care and supplied with adequate footwear. Each patient was questioned as to what he considered the most important factor in the causation of his frostbite. The results are shown in table 2.

TABLE 2.—*Factors to which patients attributed frostbit*

Grad	Long vehicl ride	Guard duty	Leadquat equipment	Combat
I	2	6	3	8
II	1	2	3	1
III	0	2	2	0

Unofficial reports indicate that patients with frostbite of equal severity in frostbite treatment centers in Japan have averaged about 45 days lost from duty. Our 20 hospitalized patients averaged 20 days in the hospital indicating a saving of 500 man-days of front line duty. Similar calculations indicate a saving of over 400 man-days with the 11 patients treated while on full combat duty.

### CONCLUSIONS

The ultimate strength and personnel of this battalion was not altered by frostbite. The minimum amount of time was lost from duty with no loss of time in transportation or in replacement depots. Self-infliction of frostbite for the purpose of evacuation was discouraged. A rapid, practical method of treating frostbite was established.

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# Banthine in the Treatment of Duodenal Ulcer<sup>(1)</sup>

Morgan M. Meyer *Lieutenant, junior grade MC, U. S. N. R.*

Julian A. Jaman, *Colonel U. S. A. F. (MC)*

**I**N DISCUSSING any new medication for peptic ulcer it is always important to bear in mind the pathophysiology of the disease itself. High gastric acidity is present in most patients with duodenal ulcer and usually there is considerable hypersecretion and hypermotility of the stomach. The actual cause of this disease has not been definitely proved, but in most of these patients there is an emotional factor which often produces an increased vagotonia with its consequent stimulation of gastric secretion and gastrointestinal motility.

Banthine is a quaternary amine which is readily soluble in ordinary solvents and in gastric and intestinal secretions. Its chemical name is beta-diethylaminoethyl xanthene-9-carboxylate methobromide. It is anticholinergic and provides autonomic ganglion blockage principally affecting the parasympathetic system (2). Its action is similar to that of atropine. It inhibits the depressor action of acetylcholine and electrical stimulation of the vagus in animals. It inhibits salivation and causes mydriasis. It manifests a double action on the parasympathetic system in that it affects the parasympathetic postganglionic nerve endings by blocking acetylcholine at that point as well as at the ganglion level which affects both sympathetic and parasympathetic nerve endings. It does not act on the postganglionic endings of the sympathetic system because their effectors liberate sympathin rather than acetylcholine. In toxic doses it has been noted to have a curare-like action on muscle effectors.

The toxicology of banthine is quite limited because the toxicity is very low and the therapeutic index is good. No acute, subacute or chronic toxicity has been noted in experiments on mice and rats.

(1) Presented at Monthly Staff Meeting, U. S. Air Force Hospital, Sheppard Air Force Base, Tex., January 1951.

(2) Brown, C. H., and Collins, E. N.: Use of banthine in treatment of duodenal ulcer: preliminary report. *Cleveland Clin. Quart.* 17: 234-241, Oct. 1950.

including microscopic tissue examination. No truly toxic manifestations in man have been reported. The side effects of banthine are believed to be important and provide good means of regulating the dosage of the drug in man. The predominant side effect in man as reported by Grimson et al (3), as well as in our series is dryness of the mouth and throat. Probably the second most common side effect is mydriasis. Rarer side effects are constipation, hoarseness, decreased perspiration, and in the older age group with prostatic hypertrophy urinary retention. Tachycardia has been noted in rare instances and occasionally has necessitated discontinuance of the drug. Impotence was reported in one patient. Most of these side effects correct themselves after 2 or 3 days with continued medication at the same dosage level or on a slight reduction in the dosage. In our series we have not been forced to discontinue the drug for any of the above side effects.

The effects of banthine on the cardiovascular system in man include occasional slight rises in pulse and blood pressure and a decrease in the skin temperature gradient from the umbilicus to the foot. No postural hypotension has been noted and only rarely in patients with a apparent sensitivity does a true tachycardia develop. The effects on the gastrointestinal system include a marked decrease in gastric motility as studied by balloon tests, barium meal, and fluoroscopic studies. This effect is much more marked than with atropine. The drug effects a decrease in the volume of secretion in the pH, and an associated decrease in the amount of free and total acids in the gastric secretion (4). This decrease in acidity and volume of secretions is definitely shown in the literature and confirmed by our clinical studies. The decrease in the volume of the secretion seems to be more apparent than that of the acidity. The drug markedly decreases the propulsive activity of the small intestine (5). The colonic activity as studied by balloon tests is decreased and the normally powerful parasympathetic stimulating effect of urecholine inhibited. The gastrocolic reflex is also inhibited by banthine but is little affected by atropine.

Table I summarizes the information concerning our patients with proved duodenal ulcer. They all had either a deformed bulb or evidence of an active crater at the time of study and all were symptomatic. The first 4 had severe hemorrhage requiring from 3 to 5 pints of blood to restore adequate blood volume and to prevent circulatory collapse. All responded favorably. The next 4 were treated with banthine in the first few months after operation for perforated duodenal ulcer or for recurrence of ulcer with the history of an old perforation. The third

(3) Grimson, E. S., Lyons, C. E., and Reeves, R. J. Clinical trial of banthine in 107 patients with peptic ulcer. *J. A. M. A.* 143: 873-877, July 8, 1950.

(4) Smith, C. A., Woodward, E. P., Jagers, C., and Dringstedt, L. R. Effect of banthine on gastric secretion in man and experimental animals. *Gastroenterology* 15: 718-726, Aug. 1950.

(5) Grimson, E. S. Clinical trial of banthine in cases of peptic ulcer. *Gastroenterology* 14: 583-587, Apr. 1950.



group includes those who were emotionally maladjusted and whose emotional difficulty was believed to be greater or greater than, their organic complaints. The results of chemotherapy in this group naturally are much poorer than in the remainder of the series. The last group had no obvious complications.

All of these patients were placed on 100 mg. of banthine every 6 hours for 48 hours, and their dose regulated according to the clinical result and the individual's susceptibility to side reactions. Usually after 48 hours the doses at 6, 12, and 6 were cut down to 75 or 50 mg. and the night dose maintained at 100 mg. All patients were placed on a progressive Sippy diet and, on admission the patients with hemorrhage were started on 3 ounces of cream every hour while awake unless vomiting. If vomiting all oral intake except banthine was withheld for a few hours until intravenous fluids and mild sedation enabled them to take liquids by mouth. Return to full duty with a maintenance dose of banthine was usually accomplished about 6 weeks after a severe hemorrhage and sooner with the other patients. Some patients were retained longer so that more complete gastric secretory studies could be made. A control period without medication was observed, and then banthine therapy was reinstated. We found the gastric acidity both free and total to be definitely lowered and night secretion to be reduced in volume from 45 to 75 percent agreeing with reports in the literature.

### SUMMARY

Twenty-one patients or 84 percent of our group were returned to duty for periods varying from 1 to 6 months on a maintenance dose of banthine and no other medication. Four patients or 16 percent were separated from the service but 3 of these were basic trainees and were discharged for the convenience of the government because their condition existed prior to service and was considered not in line of duty. The fourth patient was separated prior to the present national emergency. The men on duty are on a regular diet except for the exclusion of such harmful items as spices, roughage, carbonated beverage, alcohol and tobacco. Although it is too soon to determine the ultimate value of banthine in these patients it would seem that a greater number of patients with duodenal ulcer are able to lead a nearly normal service life with banthine than with any previously used medication.

### CONCLUSIONS

Banthine lowers gastric secretions both in acidity and in volume. It is an effective gastrointestinal antiperiodic and is a useful adjunct to the medical management of duodenal ulcer.

# Thrombophlebitis<sup>(1)</sup>

J ck T Rush *Lieutenant Colonel, MC U S. A.*

James H. Forsee *Colonel, MC U S. A.*

THE ANCIENTS were familiar with a condition known to them as phlegmasia alba dolens. This consisted of thrombophlebitis involving the iliofemoral vein resulting in edema pain, and swelling of the entire leg Available historical data indicates that Paulus of Aegina about 660 A D (2) performed the first operation for this condition by opening the saphenous vein, removing the thrombus and ligating the vein. The term phlebitis was probably first used by Breaschet in 1818 In 1865 Virchow demonstrated that thrombi in the veins were really blood clots and gave a good description of the mechanism of embolus and infarct formation. In 1875 Zahn showed that thrombus formation starts with a nucleus of white blood cells accumulating at the site of vessel injury followed by red-blood-cell agglutination (3). Surgical efforts to control thrombophlebitis by proximal vein ligation have been frequent. The first successful ligations of the inferior vena cava were performed by Bottini in 1906 and by Trendelenburg in 1910 for thrombophlebitis of the pelvic veins in patients with septicemia One of these patients recovered. Krotzki summarized the literature referable to inferior vena cava ligation to 1937 collecting only 48 cases In 1944 Homans reported 14 cases of surgical ligation of the iliac vein. Thebaut and Ward reported 36 cases of inferior vena cava ligation with two deaths (4). Present methods of management of acute thrombophlebitis of the lower extremities include anticoagulant therapy and/or superficial femoral vein ligation. Heparin and dicumarol were first used clinically in 1941 (5). These drugs have so favorably altered the course of events in thrombophlebitis as to become indispensable in its manage-

(1) From the Fitzsimons Army Hospital Denver Colo.

(2) Jensen, D R. Problem of thrombophlebitis *Ann. Surg.* 121 314-327 Mar 1945.

(3) Friedlander E. Histologic and chemical aspect of thrombus formation. *Arch. Surg.* 58: 48-53 Jan. 1949.

(4) Thebaut, B. R. and Ward, C. S. Ligation of inferior vena cava in thromboembolism; report of 36 cases. *Surg., Gynec. & Obst.* 84. 385-401 Apr. 1947

(5) Liak K. P.: Anticoagulant from spoiled sweet clover hay The Harvey Lecture Volume 39 Science Press Printing Co. Lancaster Pa., 1943. pp. 162-216.



ment. The employment of superficial femoral vein ligation was emphasized by Allen (6) and others.

Intravascular clotting is more frequently encountered in patients of advanced age. Probably over 80 percent of the clinical manifestations in patients over 40 years of age. Barker et al. (7) reported an incidence of 0.96 percent following surgical operation—of all types—2 percent for laparotomy (except repair of hernias), and 3 percent if the procedure was performed on the female pelvis. Crafoord and Jorpes (8) reported two postoperative series with a total of 1,111 patients who did not receive any anticoagulant therapy and in whom the incidence of thrombophlebitis was 6 and 9 percent. At this hospital from 1939 to 1949, 2,104 autopsies were performed; 28 (1.3 percent) deaths were caused by pulmonary embol and/or infarcts. From January 1947 to 31 December 1949 there were 42,939 admissions for operations, exclusive of the ear, eye, and nose, were performed and 2,491 women were delivered. During this period there were 100 cases of acute thrombophlebitis (0.23 percent of all admissions); 38 (0.47 percent) occurred following operation and 7 (0.19 percent) followed 2,491 deliveries. There were 14 pulmonary infarcts; 4 occurring postoperatively and none postpartum.

The patient census at this hospital ranges from 2,000 to 2,500, about half being tuberculous or neuropsychiatric patients, the other half being about equally divided between general medical and surgical patients. The patients come from practically every walk of life. Many are soldiers and veterans, the others being retired military personnel or dependents. Because most of the patients are young, the average age of those undergoing operations is about 35 years. The incidence of thrombophlebitis is low, especially when one considers the large number of patients confined to bed with tuberculosis. The constant warnings of all medical officers of the dangers of thrombophlebitis or phlebotrombosis occurring in this type of patient has led to particular attention being given to leg exercise, meticulous preoperative surgical preparation directed toward securing normal blood protein levels and hemoglobin content, and is also believed to have favorably influenced the rate at which patients are turned several times daily during the postoperative period by experienced medical officers, whose courage the patients to move their legs and wiggle their toes, early ambulation is diligently practiced. The generally accepted sharp distinction between acute thrombophlebitis and phlebotrombosis has not, in our experience, been clear.

(6) Allen, A. W. Interruption of deep veins of lower extremities in prevention and treatment of thrombotic and embolic disease. *Surg. Gynec. & Obs.* 84: 519-527 Apr. (No. 44) 1947.

(7) Barker, A. W., N. G. and, K. E. W. Ivers, W. and Priestley, J. T. Statistical study of postoperative venous thrombosis and pulmonary embolism, incidence in various types of operations. *Proc. Staff Meet. Mayo Clin.* 15: 769-773 Dec. 4, 1940.

(8) Crafoord, C. and Jorpes, E. Heparin prophylactic against thrombosis. *J. A. M. A.* 114: 7831-7835 June 28, 1941.

Intravenous clotting is caused by (1) changes resulting from an increase in the platelet count or a change in the prothrombin, fibrinogen, or calcium content of the blood, (2) stasis resulting from slowing of the blood within the veins; and (3) external or internal tissue injury. Such factors as advanced age, obesity, degenerative diseases, cardiovascular disease, and bed rest predispose to intravenous clotting. Blood chemical alterations such as hypoproteinemia, hyperglobulinemia, increased fibrinogen content, increased calcium content, and decreased carbon dioxide combining power all seem to predispose to thrombus formation. Of the 100 cases of acute thrombophlebitis herein reported, 38 were postoperative, 7 were postpartum, 24 were of undetermined origin, 9 were associated with recurrent thrombophlebitis, 11 occurred in a variety of medical conditions, 3 were secondary to fracture of the long bones, 3 occurred secondary to varicose veins, and 5 were associated with contusions.

The normal clotting mechanism is usually initiated by tissue damage either mechanical or infectious, or from a slowing of the circulation with irritation of the endothelial linings of the veins. In this mechanism thrombokinase is liberated, neutralizing the antithrombin which allows prothrombin to combine with calcium in the presence of vitamin K to form thrombin. Thrombin stimulates fibrinogen to form fibrin which is a framework on which the clot forms. In this meshwork of fibrin the platelets are agglutinated to form the nucleus around which white and red blood cells are agglutinated. A thrombus consists of a "white head" adherent to the vascular wall and a "red tail" fixed at one end to the white head with the other end floating freely in the blood stream. Loose coagulated red blood cells which are attached to the floating tail of the clot may at any time break loose, acting as free-floating bodies from the veins of the legs and pass through the inferior vena cava and right heart to the lungs. If the embolus is small the patient may have only slight dyspnea, pain, and hemoptysis which clears spontaneously. If the embolus is large the patient may develop a pulmonary infarct with serious complications.

The diagnosis of acute thrombophlebitis is usually easily made by properly evaluating the symptoms. Of the 100 patients having acute thrombophlebitis at this hospital the initial symptoms were pain in the calf of the leg (62 percent), pain in the thigh or groin (23 percent), or sudden pain in the chest with dyspnea and hemoptysis (12 percent). The most important physical finding is tenderness in the calf of the leg and along the popliteal and femoral veins. This tenderness is often the first sign of acute thrombophlebitis and may be elicited by careful examination before the patient is aware of any discomfort and was noted on palpation in 83 percent of our patients. Homans' sign (pain in the calf and popliteal space or dorsiflexion of the foot) was present in 75 percent. The diagnosis is further confirmed by the presence of swelling of the leg, increased temperature, and dilated superficial veins.

After the diagnosis of acute thrombophlebitis is made it is our practice to place the patient at bed rest, elevate the affected extremity and if there is infection or cellulitis 300,000 units of penicillin is given daily until the infection subsides. 50 mg. of heparin is given intravenously every 4 hours for 36 hours; 300 mg. of dicumarol the first day, 200 mg. the second day and 100 mg. the third day given orally is generally prescribed for a 150-pound adult. A daily prothrombin time determination is obtained and dicumarol sufficient to keep the prothrombin level at about 20 percent of normal is given. Patients are allowed out of bed as soon as the acute inflammation has subsided and it is no longer painful for them to walk. Dicumarol is continued until tenderness has disappeared usually from 14 to 21 days. Residual tenderness in the calf muscles is often improved by short-wave diathermy. In our series there has been no excessive bleeding associated with anticoagulant therapy. If an operation becomes necessary on a patient receiving anticoagulant therapy the prothrombin time should be brought above 35 percent of normal by the use of whole blood transfusions and vitamin K.

The only indication we have used for proximal venous ligation is the failure of anticoagulant therapy to prevent recurrent pulmonary emboli. Two patients required proximal venous ligation. One patient had an inferior vena cava ligation after anticoagulant therapy and bilateral superficial femoral vein ligation which failed to prevent pulmonary emboli. No more emboli occurred and the patient returned to full military duty 2 months after operation. The other patient had multiple pulmonary emboli from a recurrent thrombophlebitis of the right leg which did not respond to anticoagulant therapy. A right common iliac vein ligation achieved good results. Adequate anticoagulant therapy greatly aided in effective control of acute thrombophlebitis in 97 percent of our patients. If arteriospasm with edema is a prominent symptom, daily lumbar sympathetic block with 1 percent procaine are performed until the edema subsides.

We have used heparin-dicumarol therapy: (1) in all patients with acute thrombophlebitis as an aid in preventing spread of the thrombus, (2) in the presence of pulmonary embolism, (3) as a prophylaxis against postoperative thrombophlebitis in debilitated patients who are to be confined to bed for long periods postoperatively, (4) as prophylaxis against thrombosis following splenectomy when the platelet count rises above 500,000, (5) occasionally to prevent thrombosis in an artery following arterial operation, and (6) occasionally in patients with advanced arteriosclerosis to prevent thrombosis.

We have considered the following as contraindications to heparin and dicumarol therapy: (1) recent operation on the brain and spinal cord, (2) the presence of recent excessive bleeding of undetermined cause and (3) the late antepartum period.

The complication of thrombophlebitis are pulmonary emboli which may occur silently preceding the symptoms of thrombophlebitis and the

postphlebitis syndrome with chronic venostasis, which is a late complication and may not develop for several years after the acute attack. The onset of pulmonary embolism is usually characterized by sudden dyspnea followed by pain in the chest. A rapid pulse, marked restlessness, difficult rapid breathing, pallor, and sweating are the indications of shock accompanying a severe pulmonary embolism. Hemoptysis is present in about 50 percent of the patients. A friction rub, roentgenographic evidence of increased density or mottling (fig. 1) with electro-

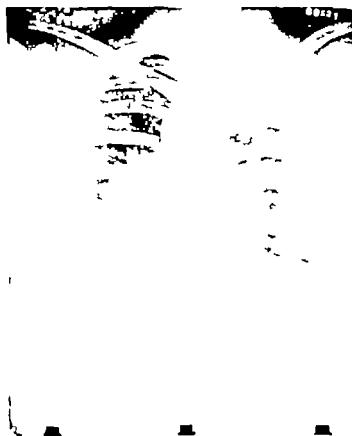


Figure 1—Infarct of left lung following acute thrombophlebitis of right leg

cardiographic evidence simulating acute cor pulmonale has been of greatest aid in the presence of relatively large infarcts. In this series of 14 patients presenting findings of pulmonary emboli, symptoms of acute thrombophlebitis were present or followed within 24 hours. Patients with pulmonary emboli require emergency treatment consisting of a semisitting position, oxygen, and 0.8 mg. of atropine every 4 hours. A bedside chest roentgenogram should be secured as soon as the patient's condition permits and an electrocardiographic tracing obtained without disturbing the patient. Pain is probably best relieved by the immediate hypodermic injection of 100 mg. of demerol hydrochloride.

An intravenous infusion of normal saline solution containing about 200 mg. of heparin per liter should be started at the rate of 25 drops per minute and continued until the urgent symptoms have subsided. The coagulation time (Lee-White method) should be kept well over 15 minutes. The only death from pulmonary embolism in this series occurred in a 74-year-old Negro who had been operated on because of a ruptured appendix. He was allowed up on the second postoperative day and on the fifth postoperative day died suddenly without preceding symptoms or anticoagulant therapy. Postmortem examination revealed massive pulmonary embolism.

The diagnosis of chronic venous insufficiency caused by old thrombophlebitis with obstruction and recanalization of the deep vessel of the thigh and leg is made by physical examination, determining the venous pressures in the veins of the extremities and by phlebography. The extremity is characteristically noted to have varying degrees of cyanosis, subcutaneous induration, edema, dilated superficial veins, dermatitis, pigmentation, and ulceration of the skin about the ankle (fig. 2). Venous pressures taken in the ankle veins reveal measurements



Figure 2.—Patient with mild edema, venous distention, cyanosis, induration and pigmentation about the ankle.

of from 20 to 30 cm. of water. If the superficial femoral vein has become markedly recanalized this venous pressure decreases. Phlebograms of the extremities usually reveal obstruction of the deep veins of the calf marked dilatation and tortuosity of the superficial veins obliteration of the popliteal and superficial femoral vein, and evidence of new anastomotic channels (fig 3). Homans (9) reported that once obstructive thrombophlebitis has become established in the femoro-iliac veins edema in some degree persists. Bauer (10) wrote that a deficient venous return is responsible for the edema and depreciates the lymphatic and vasoconstricting elements in the production of the edema. The recanalized vein is regarded as a source of back pressure of venous blood in the extremity and superficial femoral vein ligation and excision of a segment usually gives good symptomatic results in properly selected cases. The leg does not seem to be as heavy or congested and there is improvement in the circulation. The explanation offered for this improvement is that the superficial femoral vein is functionally useless and is best eliminated as adequate collateral circulation has been established. In our experience with 25 patients beneficial results have generally followed but the edema has seldom been markedly influenced by the operation. Lumbar sympathectomy is indicated in certain patients.

#### SUMMARY

Ninety-nine patients with acute thrombophlebitis occurring in 42 939 admissions to this hospital were treated with anticoagulants between 1 January 1947 and 31 December 1949. The results were satisfactory in 97 patients. 2 required inferior vena cava or right common iliac vein ligation to prevent further pulmonary emboli. One 74-year-old patient died of pulmonary emboli suddenly and without having received anti-coagulant therapy following appendectomy. Penicillin is used in the presence of cellulitis. Lumbar sympathetic nerve block has been especially beneficial in relieving arteriospasm. Short-wave diathermy is




Figure 3—Phlebogram showing non-filling of deep calf, popliteal, and femoral veins.

(9) Homans J: Last result of femoral thrombophlebitis and their treatment. *New England J Med.* 235:249-253 Aug 22 1946.

(10) Base G A: Roentgenological and clinical study of sequelae of thrombosis. *Acta chir Scandina* 86:(Supp) 74, 1942

of value in treating the postphlebotic fibrosis. The occurrence of pulmonary emboli can be minimized by meticulous pre- and post-operative care. Patients with pulmonary emboli require immediate therapy. Postphlebotic venostasis has been treated with good symptomatic results by superficial femoral vein ligation combined when indicated with lumbar sympathectomy.

# Hydrophilic Forms of Tars

Solomo C. Pflag, *Lieutenant, MSC, U. S. N.* (1)

Lou C. Zopf, *M. S.* (2)

THE TARS for many decades have been important members of the armamentarium of the dermatologist. Because they offered a great challenge to pharmacists in their quest for more esthetic and pharmaceutically elegant preparations this problem was studied. Tars are products obtained in the destructive distillation of various organic substances. Although they vary in color, viscosity, and chemical composition depending on the materials they are derived from and the method of production involved, they have the annoying and common characteristic of not being soluble or miscible in water.

One of the most commonly used tars, coal tar, is obtained from the destructive distillation of bituminous coal. Low-temperature coal tars (those distilled at about 600°C.) (3) differ greatly from the high-temperature coal tars (distilled at 1,400°C.) (4). The former contain unsaturated hydrocarbons, naphthenes, paraffins, phenols, and pyridines, whereas the latter consist of benzol and its homologues, naphthalene, anthracene, phenanthrene, solid aromatic bodies, and substantially higher percentages of free carbon (4). One can therefore theorize that high-temperature tars result from the decomposition of low-temperature tars and that because we are evaluating two chemically different products, the therapeutic response will not be consistent.

There is much confusion concerning the relative merits of high- versus low-temperature coal tars. Combes (5, 6) stated that low-temperature coal tars are desirable medicinally. Downing and Bauer (7),

(1) U. S. Naval Hospital Corp. School, San Diego, Calif.

(2) Member, Revision Committee for the U. S. Pharmacopoeia.

(3) Morgan, G. T. "Chemistry of low-temperature tar," *J. Soc. Chemical Industry* 31: 67-71, 1932.

(4) Abraham, H. "Asphalt and Allied Substances," Volume I, 5th edition, D. Van Nostrand Company, New York, N. Y., 1945.

(5) Combes, F. C. "Coal tar in dermatology: improvement in its physical properties without any change in its therapeutic action," *Arch. Dermat. Syph.* 56: 585-588, Nov. 1947.

(6) Combes, F. C. "Coal tar in medicine: brief study of its manufacture, composition, and use in industrial dermatitis," *Indust. Med.* 13: 550-552, July 1944.

(7) Downing, J. G., and Bauer, C. W. "Low and high-temperature coal tars in treatment of eczema and psoriasis: clinical investigation and evaluation," *Arch. Dermat. Syph.* 5: 985-990, July 1948.



on the other hand, found that high-temperature tars produced a better clinical response when they used alcoholic extracts of high- and low-temperature tars in an ointment base.

The objective of this article is: (1) to direct the attention of the medical and pharmaceutical professions and the Committee of the Revision of the U. S. Pharmacopoeia to the need for suitable standards for coal tar; (2) to devise a simple test to distinguish between high- and low-temperature coal tars; (3) to increase the range of usefulness of tars by rendering them water-dispersible and thus permit the production of finer pharmaceuticals; and (4) to produce smoother, more uniform coal-tar-ointment preparations. Obermayer and Becker (8) stated that coal tars which have had fractions removed have one property in common—their total pharmacologic effect is usually less than that of original crude coal tar. In this investigation no attempt was made to remove any fractions nor to modify the normally occurring constituents of the coal and wood tars.

### EXPERIMENTAL DATA

In order to develop a water-dispersible tar it was deemed advisable to experiment with many surface-active agents (detergents, dispersing agents, emulsifiers, solubilizers, and surface tension depressants). Many anionic agents, for example, sodium lauryl sulfate, were tried along with such cationic substances as the quaternary ammonium salts, and in each case the tars could not be made to disperse satisfactorily in aqueous vehicles. The nonionic agents represented by polyoxyethylene sorbitan monolaurate (Tween 20) gave the most satisfactory results.

**Aqueous lotions.**—Tween 20 was mixed with crude coal tar in varying proportions. Distilled water was added with constant stirring and a well-dispersed tar-in-water mixture resulted. This mixture was a combination emulsion and dispersion of solid particles (pitch and resin) of tar. A satisfactory ratio between tween 20 and the crude coal tar was established as 4 parts by weight of tween 20 to 1 of crude coal tar. The tween 20 was mixed with the coal tar in a mortar and the aqueous phase was slowly added with constant trituration. The resulting product had a very small particle size. A lotion prepared by the following formula gave a particle size of about 21 microns:

Crude coal tar	1
Tween 20	4
Zinc oxid	16
Glycerin	2
Dipentolate magn	40
Calcium hydroxide	
Lotion, U. S. P. to make 100	

(8) Obermayer, M. E., and Becker, S. R. Study of crude coal tar and its medicinal value. Preliminary report. Arch. Derm. Syph. 51: 796-810 Jan. 1935.

The coal tar was evenly dispersed throughout the lotion. After application to the skin the lotion was easily removed with soap and water. Thus coal tar can now be prescribed in aqueous vehicles and a well recognized incompatibility is overcome. The range of usefulness of coal tar is thus increased and offers many new possibilities. Tween 20-coal tar mixtures were found to be compatible with aqueous vehicles, collodion (9), tincture of green soap, pectin and tragacanth pastes (10). It was incompatible with fixed oils, mineral oil and alcoholic solutions containing alcohol in excess of 10 percent.

Because of the similarity of polyethylene glycol 400 monolaurate and polyethylene glycol 400 dilaurate to tween 20 (11) these agents were tried. It was found that polyethylene glycol 400 monolaurate could be added to crude coal tar in the same proportions as tween 20 and that the resultant mixture had properties similar to those of the tween 20-coal tar mixture. Polyethylene glycol 400 dilaurate-coal tar mixtures were found to be compatible with fixed oils and are recommended for coal tar-fixed oil mixtures.

*Ointments*—It was found that certain nonionic agents mixed with coal tar and incorporated in ointment bases markedly reduced the particle size of coal tar in the finished ointment. Successful results were obtained through use of the following: (1) tween 20, 40 (12), 60 (13) and 80 (14); (2) polyethylene glycol 400 monolaurate; (3) polyethylene glycol 400 monostearate; and (4) polyethylene glycol 400 dilaurate. The coal tar particle size was reduced from 100 to less than 3 microns in coal tar ointment (U S P) by the use of the nonionic agents mentioned. The resulting ointment was smooth, grit free and homogeneous. The increased hydrophilic property of these ointments aided in absorbing exudates.

In an investigation designed to determine the minimum amount of these nonionic agents to be used in conjunction with crude coal tar in Lassar's paste it was found that one-half part of these nonionic agents mixed with one part of crude coal tar was satisfactory. Particle size was reduced many times. In all cases 1 percent crude coal tar (high-temperature) was thoroughly mixed with the tween 20 before being incorporated with Lassar's paste. The hydrophilic properties of the finished product varied in direct proportion to the amount of tween 20 added. Ointments prepared with mixtures of coal tar and the nonionic agents were stable at room temperature and as far as can be determined

(9) *The Pharmacopoeia of the United States of America*, 13th edition, Mack Publishing Co., Easton, Pa., 1947.

(10) Cook, E. F. and Martin, E. W.: *Remington's Practice of Pharmacy*, 9th edition, Mack Publishing Co., Easton, Pa., 1948.

(11) *Drug and Cosmetic Emulsions*, Atlas Powder Co., Wilmington, Del., 1947.

(12) Polyethylene sorbitan monopalmitate.

(13) Polyethylene sorbitan monostearate.

(14) Polyethylene sorbitan monooleate.

in the time all tested were no more irritating than other coal tar ointments. It might be added that a total of 200 pounds of ointment was employed at the University of Iowa Hospitals in evaluating these clinical results.

Kranz (15) in extensive pharmacologic investigation over a period of 5 years found that tweens applied to skin and mucous membranes were not harmful to tissue. Different methods of compounding coal tar ointment containing these nonionic agents produced consistent results. White (16) using modified Lassar's paste with 5 percent crude coal tar stated that it was necessary to mix the coal tar with the zinc oxide and the starch with the petrolatum and then to combine the two. The resulting product was claimed to be smooth. Our results indicate that, with the exception of the fusion method, if the crude coal tar is first mixed with the nonionic agent, results can be duplicated no matter how it is incorporated. This point is important. The many different methods of incorporation practiced by pharmacists will result in a uniform product. It is recommended that coal tar ointment (U. S. P.) be manufactured with one of these nonionic agents in the same proportion as indicated by the work.

Hartman and Zopf (17) suggested that smaller amounts of coal tar be used where surface-active agents are combined with coal tar because in the mixture the coal tar comes more intimately into contact with the skin. Our findings confirm this work.

*Standardization of coal tar.*—Adams et al. (18) succeeded in standardizing coal tar by isolation of the residual solids through the use of benzene and light liquid petroleum. The test involved the use of a distillation apparatus and was time consuming. In preliminary tests conducted with tween 20-coal tar mixture it was found possible to isolate the residual solids of coal tar as follows:

Two grams of coal tar were mixed with 8 grams of tween 20. The mixture was then poured into 100 cc. of distilled water and rapidly stirred. The mixture was filtered through hard filter paper (No. 50). The precipitate was washed with distilled water until free of soluble material, indicated by a clear colorless filtrate. It was then air-dried and weighed. The percent precipitate was then calculated. It was found that low-temperature tars ranged from 5 to 10 percent precipitate, whereas high-temperature tars gave higher percentages averaging from 40 to 60 percent.

(15) Kranz, J. C. *Feeding Test Results on Mammals and Some of Their Fatty Acid Reaction Products*. Adis Powder Co., Wilmington, Del.

(16) White, C. J. *Crude coal tar in dermatology*. *Arch. Derm. & Syph.* 4: 776, Dec. 1921.

(17) Hartman, M., and Zopf, L. C. *Notes on levigating agents and incorporation procedures for suspending ointments*. *J. Am. Pharm. A., Practical Pharmaceutical Edition* 214-217, Apr. 1942.

(18) Adams, W. G., Shannon, W. V., and Sack, J. S. *Food Tars*. *Journal of the Society of Chemical Industry* 54: 414 T, 1937.

*Wood tars.*—In experiments designed to solubilize juniper tar (cade oil), it was found that 3 parts by weight of tween 20 was needed to solubilize 1 part by weight of juniper tar. The resulting mixture tween 20-juniper tar when diluted with distilled water in all proportions, produced a clear transparent solution. A 1 percent solution of juniper tar in distilled water prepared in this manner and placed in an ordinary flint bottle has been stable for over 6 months and showed no signs of separating. Polyethylene glycol 400 monolaurate and sulfonated castor oil on the other hand produced opaque emulsions from which the oil of cade separated after 24 hours. Pine tar mixed with 4 parts of tween 20 produced a transparent emulsion. Polyethylene glycol 400 monolaurate produced an opaque emulsion which was unstable after 24 hours and liberated free pine tar.

#### SUMMARY

A hydrophilic coal tar formula using tween 20 or polyethylene glycol 400 monolaurate is presented. The particle size of coal tar in ointment bases is reduced by means of these preparations. It is recommended that coal tar ointment (U S P) be manufactured with one of these non-ionic agents in the same proportions as indicated by this work. A possible standardization procedure for coal tar is suggested. A formula for solubilized wood tar is presented.

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# Tantalum Foil Used in Closing Antro-Oral Fistulas

Earle J. McClung, Colonel, DC, U. S. A. (1)

James E. Chipp, Major, DC, U. S. A. (1)

**I**N CLOSING chronic antro-oral fistulas of the alveolar ridge most operators use some plastic surgical procedure because those methods which might permit a simple approximation of the wound edges frequently result in failure. The most satisfactory method of closure consists of excising the fistula, raising a pedicle flap from the palatal tissue, turning the flap across the alveolar defect and inserting the free end of the flap beneath the undermined buccal mucosa (2). Thoma has discussed certain disadvantages associated with the method. The donor site is denuded and requires postoperative care. The exposed palatal bone is subject to secondary infection. The flap may break down from inadequate blood supply caused by improper design, excessive suture tension, or secondary infection. Furthermore the elevated tissue resulting from turning the flap and the depression remaining in the donor site may so alter the mucosal contour that the patient may no longer be able to wear a previously-constructed denture and new denture construction may have to be postponed until healing is nearly complete.

Bellinger (3) has described the properties and some of the uses of tantalum in oral surgery, noting that the metal does not seem to produce a foreign-body tissue reaction and that exposure of the metal to the mouth does not seem to interfere with its tolerance by the tissues. He described a patient in whom a large tantalum splint was used following partial mandibular resection. The splint was exposed to the mouth throughout its length but there was a gradual proliferation of mucosa from the edges which eventually covered the splint. Bellinger also mentioned that he had used tantalum sheet in the closure of an antro-oral opening that had resisted five previous attempts at closure.

(1) Madigan General Hospital, Tacoma, Wash.

(2) Thoma, K. H., *Oral Surgery* C. V. Mosby Company, St. Louis, Mo., 1948, Vol. 1, pp. 764-769.

(3) Bellinger, D. H.: Preliminary report on a (tantalum in maxillofacial and oral surgery) *J. Oral Surg.* 5: 109-122, Apr. 1947.

We have successfully used tantalum foil in four chronic oro-oral fistulas. The tantalum was inserted by simple surgical procedures which precluded the disadvantages associated with raising a pedicle flap. Each patient gave a history of one or more previous attempts to obtain a closure. The postoperative course was remarkably uniform. A typical case is reported.

### CASE REPORT

A 40-year-old man had all of his teeth removed and dentures constructed in March 1949. He noted the continuing accumulation of mucopurulent debris beneath his denture and the passage of air into his mouth when he blew his nose. An oro-oral fistula in the left maxillary first molar area was diagnosed by his dentist and an unsuccessful attempt at closure was performed. In June 1949 the patient was hospitalized because of a cure maxillary sinusitis. A Caldwell-Luc operation was performed. During the procedure a second unsuccessful attempt was made to close the fistula. After observations and treatments for sinusitis until November 1949 he was referred to our clinic symptom-free except for the presence of the fistula.

Radiographs showed no gross changes in the sinuses and good nasal drainage of the left maxillary sinus provided by an opening about 1 cm. in diameter in the wall of the inferior nasal meatus which resulted from the recent Caldwell-Luc operation. A small oro-oral fistula was present in the left first molar area. A yellow discharge could be obtained through the fistula when the patient blew his nose with the nostrils closed.

He was given 50,000 units of penicillin every 3 hours. Under procaine anesthesia the fistula was narrowly excised and the chronic inflammatory tissues present in the bone defect and the intra-oral margin of the fistula were removed by curettage. An incision along the crest of the alveolar ridge was made through the fistula site. It was of sufficient length that when forked anteriorly and carried palatally and buccally palatal and buccal flaps could be raised sufficiently to expose the entire bony defect. These flaps were slightly undermined and pieces of tantalum foil, 0.00025-inch thick and about 1 inch in diameter, was burnished over the bony defect and tucked beneath the underlined flaps. The flaps were reapproximated and sutured without tension, the foil remaining exposed slightly at the previous fistula site. The patient's upper denture was inserted over the operative area.

Three days after operation the wound was seen to be healing throughout its length except for the slight defect at the fistula site where about 3 mm. of foil remained visible. The patient had no complaint while wearing his denture normally and no discharge was noted during gentle attempts at nose-blowing. The sutures were removed and penicillin was discontinued. The patient was directed to report for observation at weekly intervals. It was anticipated that regeneration of the



*Figure 1—Superficial tissue retraction exposing anterior margin of tantalum foil 9 weeks after insertion.*

mucosa from the wound edges would result in complete coverage of the foil in a manner similar to that of the patient described by Bellinger. By the end of the third week, however, it was evident that instead of regenerating the mucosa was slowly retracting, more and more of the foil becoming visible. It was thought that the procedure had probably failed but as there was no discharge and the patient had no complaints, no interference was attempted.

By the end of the ninth postoperative week, retraction of the mucosal edges had progressed so that the anterior edge of the tantalum foil was visible (fig. 1). The tantalum was then removed by grasping its edge with a tissue forceps. It was found that the bony defect deep to the tantalum was completely covered with late-stage granulation tis-



*Figure 2—Immediately after removal of tantalum foil showing the new tissue which had closed the defect.*



sire (fig. 2). The new tissue was not hemorrhagic and could not be probed. In subsequent weeks the redness in the new tissue gradually faded and the area was apparently covered by normal epithelium.

### COMMENT

Three patients later treated in this way showed similar postoperative courses. After gradual retraction of the superficial wound edges for from 7 to 9 weeks the tantalum was removed to reveal a closure of the defect with new tissue deep to the tantalum in situ. We believe that the tantalum (1) acted as a mechanical dam, preventing the movement of fluids through the wound with the frequent pressure changes which accompany sucking, swallowing, inhalation, or exhalation; and (2) served as a support for the blood clot and subsequent granulation tissue forming on its deep surface. We have used tantalum foil of 0.00025-inch, 0.00050-inch, and 0.0125-inch thickness. Similar results were obtained in each instance but the thinner foil was most easily manipulated.

Our four patients were edentulous and we have had no opportunity to use this technic in a fistula existing between adjacent teeth. In such a case we have thought that a butterfly-shaped piece of foil inserted beneath buccal and palatal flaps raised by incisions about the necks of the adjacent teeth might prove successful.

### CONCLUSIONS

The important points for consideration in this procedure seem to be (1) elimination of gross vital changes before attempting closure; (2) establishing moderate hemostasis by curettage deep to the tantalum foil; and (3) eventual removal of the foil. Some patients might show complete closure both deep and superficial to the foil, in which case the foil could be permanently left in place. In patients similar to ours, however, removal of the foil seems to be the only method for satisfying the patient and the operator that an actual closure has been accomplished.

# The Improvement of Professional Relations in Hospitals<sup>(1)</sup>

Richard A. Kern M. D. (2)

THE improvement of relations in a hospital between members of its professional and also its nonprofessional staff is a matter of prime importance to those who are charged with hospital administration. Some of the differences between the running of a civilian hospital and the running of a service hospital are not clearly understood by all concerned. An example of this appeared in a publication of the Hoover Commission, *Reorganization News* in November 1949. Set off in a box to attract attention and under the heading "Can't we save some money here?" the Commission reported the following figures for length of stay in days: for nonfederal and for Army and Navy hospitals: Tonsillectomy in nonfederal hospitals 14 days in Navy hospitals 13.3 days in Army hospitals 16.1 days; appendectomy in nonfederal hospitals 7.8 days in Navy hospitals 20.3 days and so on.

Having spent nearly 7 years of my professional career in active naval service and having had frequent contact with service medicine during another 30 years I promptly wrote the editor that a destroyer at sea was no place for a patient 14 days after a tonsillectomy or 7.8 days after an appendectomy if the editor did not believe it, let him try being seasick under those circumstances. Civilians do not know that such convalescent patients in service hospitals are treated in a most economical fashion, in that for one thing, all of them are fed cafeteria style no civilian hospital that I know of has cafeteria service for ambulatory patients. Furthermore civilians do not realize that such convalescent patients are assigned to working parties as soon as their condition permits and that they so contribute more and more to their

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(1) Presented before the Inter-Agency Seminar on Hospital Administration, the National Naval Medical Center, Bethesda, Md., 23 April 1951.

(2) Commodore MC, U. S. N. R. (Inactive). Professor of Medicine and Head of the Department Temple University School of Medicine Philadelphia, Pa.

own maintenance. On my second day of active duty in a naval hospital I proudly discharged to duty a patient who had been in the hospital 88 days for mumps. My ears still tingle at the memory of what the Skipper had to say to me for depriving the hospital of the services of the best carpenter in the Fourth Naval District.

The problems in the field of professional relations in our hospitals have their origin largely in the greatly increased complexity of modern medical practice. Every aspect of the care of the patient and the responsibility for that care has been more and more subdivided among more and more persons, an increasing number of whom are not physicians but include nurses and technicians each with special medical and also nonmedical skills and functions. This trend is moving the physician ever further away from contact with and a knowledge of the ancillary services that help to make up a modern hospital. Moreover, the 4 years of medical school teaching are so crowded with the need for imparting medical facts that deans and professors are ever more reluctant to allot precious hours in the curriculum to nonmedical subjects, knowledge of which is nevertheless so necessary. As a result, the average physician at graduation knows far too little about such things as nursing, dietetics, pharmaceutical matters, the problems of supply and hospital maintenance, and of social service.

Let me cite one example of such increased complexity in hospital function—the feeding of our patients. When I became an intern in 1914 in an excellent 350-bed military hospital, a central galley presided over by a chef with hospital training took care of all in the institution. A nurse trained in dietetics exercised mild supervision. There were just 3 diet prescriptions: liquid diet, soft diet, and full diet. The only modification in any frequent use was supplemental feeding in the form of gruel with or without whiskey. Think of the multiplicity (and the cost) of the many special diets of today and the important functions of the dietitian.

The first point that I wish to emphasize is the need of some systematic instruction of physicians in the functioning of the ancillary services of the hospital. I do not mean that we should make a hospital administrator out of every physician, but imply that he should be made aware of the existence of these services and to know a little of the way in which they function. Such instruction must begin at the medical student level. Whenever possible, it ought to be instruction of a practical kind. Take pharmacy for example. At some time early in his duty as a first clerk or third year clerk, every student should be required to spend several hours in the drug room of the hospital, see what the pharmacist does, learn a little of what drugs look like and what they cost, and get some advice from the pharmacist how to avoid making the mistakes that doctors most often commit in writing prescriptions.

It would organize social service workers in the actual work-up of one of his patients, including not only the obtaining of the social

social history but if possible a visit to the patient's home to see how important the environment is in the treatment not of a disease but of a person who happens to be ill. In the same way he should have contact with the laboratories see what a burden of work and of expense every request for a test involves and how much of it is unnecessary. Such instruction at the student level is now being carried out in many places.

The instruction should be continued at the intern level. Here little is being done today in any of our hospitals service or civilian. We take for granted that the M. D. degree in some magical way transforms the senior student in June into a competent intern in July who needs no more formal instruction, but merely to accumulate so-called experience. Yet he is woefully ignorant about nearly everything that pertains to the operation of a hospital. For example his knowledge of practical nursing is close to the level of the absolute zero. The least he should do is read an elementary text on the subject. He can learn much by casual observation of the nursing of his patients. It would be better if there were occasional demonstrations of certain nursing techniques.

In every service hospital it is recognized that the new intern needs to be indoctrinated in certain matters of routine custom and procedure peculiar to that service. Therefore soon after his arrival he receives instruction in such matters well known to all of you. Is it not equally desirable to teach him something about many other aspects of the practical operation of a hospital? He ought to be taken on a tour of the commissary department, to get some inkling of food procurement, processing, inspection and cost. He should be required at some early date to inspect the food trays as they are served to patients and then to check those same trays after leaving the patients. Food wastage is a most important item in the case of the daily ration. Such tray inspection might teach him that he is responsible for much of the wastage when he sees on the outgoing tray the uneaten meat the costliest of food items which an edentulous patient could not chew. Now nearly everyone who has anything to do with the ordering and serving of food to our patients (the intern, the junior staff member the nurse the hospital corpsman the dietitian) is a young person with plenty of teeth of his own who does not give a thought to the teeth of his patients. Yet the aged and toothless comprise the majority of the patients in all civilian general hospitals and a growing proportion even in our service institutions.

In the same way he should be introduced to the several other non-professional activities of the hospital the engineering department the machine shop the various maintenance services. He should know the chief electrician carpenter and painter. He should develop a consciousness of the significance of a dripping faucet, an open window in winter an unneeded burning light in terms of the waste they imply.

It is indeed important to indoctrinate the intern and junior physician in what makes a hospital tick because all too often their ignorance of those things is responsible for inefficiency and waste in many aspects of hospital function.

Chiefs of professional services have an important part to play in maintaining contact both with other professional medical services and with ancillary services. At a weekly staff seminar say of the medical service a representative of the laboratory of the x-ray department, and of such other departments a current items bring into the picture should always be present. That is the best way to discover troubles in their beginning. It also adds immeasurably to the value of the discussion and ensures the most efficient all-around cooperation.

A senior nurse should accompany the staff on ward rounds to report on observations made by her or by other nurses to hear the discussion of cases and to transmit the information to her staff. It is only in such a way that the nursing service can reach its highest state of efficiency.

The importance of team work at professional levels is well known and its implementation well established. The tumor conference is an excellent example of this fact. It is the means for insuring for the patient the best in diagnosis and treatment that the hospital affords and it is the best practical school for the young physician but this is true only if the chiefs of the clinical services the pathologist, and the radiologist are invariably in attendance at each conference and if all junior medical officers are obliged to attend. Another important example is the rehabilitation team. Rehabilitation is a relatively new term in military medicine but its significance is old. The military physician has conventionally minded not just the curing of an illness or the healing of a wound but the complete restoration of the patient to normal so that from the hospital he can be returned to full duty. It is only a single further step in the case of those not returnable to full or limited duty to prepare them for return in civilian life to a gainful occupation that is in keeping with their residual handicaps. This task the service hospitals learned to perform during the recent war with a high degree of efficiency and they have continued to do so since the war not only in the military hospital but also in those of the Veterans Administration.

In civilian hospitals this subject has received relatively little attention except in those institutions that are the last refuge of patients with chronic or incurable disease. Civilian general hospitals have placed their chief emphasis on the treatment of acute disease because in civilian life the patient's convalescence and his physical and mental readjustment take place mostly in his own home. Consequently during the period of acute disease much valuable time is lost in civilian hospitals by the failure to give attention to the ultimate rehabilitation of the patient. In nondermatological hospitals especially in teaching institu-

tions should turn to service hospitals for the many valuable lessons that have there been learned in this important field

Service hospitals have several important advantages over civilian institutions in carrying out a rehabilitation program. It is possible to group in a few hospitals all the cases of a single type to assign a staff with appropriate skills in that condition to those hospitals and to equip them with all the things necessary to implement a complete rehabilitation program. Moreover the service hospitals through economic as well as military authority have a degree of control over their patients that no civilian hospital can ever hope to exercise. Service centers for the blind, for the deaf for amputees and for those with certain neurologic and psychiatric conditions have been able to achieve a high average level of successful readjustment.

Certain basic principles must be observed to carry on a satisfactory rehabilitation program.

1 *Rehabilitation begins on the day a patient is admitted to the hospital.* If he presents a short acute condition from which recovery will be early and complete no formal program of rehabilitation is needed but the longer the condition is likely to last and the greater the probable eventual handicap the more necessary is such a program and the sooner it should be started. When the need for rehabilitation is obvious on admission for instance blindness or deafness or loss of limb, the program must begin on the day of admission to the hospital. This decision is the responsibility of the ward medical officer.

2 *Teams of workers must be established to carry out such programs.* In addition to the medical officer in whose special field of interest the patient's basic defect lies there should be such additional members to round out the team as the condition calls for. A team could therefore be small (doctor nurse and dietitian to train the diabetic) or a highly complex group (for the blind, an individual attendant, a trainer in orientation, an instructor in braille a psychiatrist an educational officer a social worker a chaplain and eventually such additional instructors as are needed for vocational and avocational training and adaptation).

3 It is however just as important that the diabetic patient's training begin as soon as possible after admission as it is for the blind patient. This too is the responsibility of the ward medical officer.

4 *Rehabilitation teams must meet regularly say once a week to keep programs moving smoothly.*

(I have used the word team repeatedly. From the viewpoint of the hospital administration it has this important function *it fixes responsibility.* What is everybody's business in the end is nobody's business and so is often done indifferently or not at all. The members of a team know what to do and do it well. Let me cite you an instance of the value of such a team. I wonder how many of you know how well the

oxygen therapy in oxygen tents is being carried out in your hospital? If you do not know then I can assure you that it is probably being done badly. I have proved that point in a number of hospitals in this way. An analysis of the oxygen percentage inside such tents while routinely in use showed a concentration that 23 out of 25 times was under 30 percent, and often under 25 percent. Such oxygen therapy was treating only the doctor and the family but certainly not the patient. Yet someone was paying for the oxygen which was flowing into the tent at a rate to insure a concentration of at least 38 percent. An oxygen therapy team consisting of a nurse and two hospital corpsmen solved the problem on my medical service at the U. S. Naval Hospital Philadelphia, Pa., where there were up to 29 tents in use at a time by making an oxygen analysis requiring only 2 or 3 minutes at the bedside and costing only a small fraction of a cent once every 12 hours and noting the result on a tag tied to the tent. Whenever an analysis showed less than 38 percent the ward staff promptly sought for and corrected the cause: a tent not properly tucked in, an open zipper, a hole in the tent, a loose connection, no rubber draw sheet over the upper end of the mattress. If you now have no such control on oxygen therapy in your hospital this one practical point will have justified my appearance before you.)

5 Each large general hospital must have a coordinating and activating person who shall have cognizance of all types of rehabilitation *the rehabilitation officer*. He is the park-plug of the set-up and the success of the program depends in large measure on his interest, initiative and leadership. He should have the assistance of a *rehabilitation committee* or *board* whose members represent the chief educational and social as well as clinical departments. The rehabilitation committee should hold a regular weekly session with planned agenda as well as time for free discussion.

A major responsibility for fostering cooperation and understanding between all hospital departments lay as well as professional rests on the *hospital administrator*. A weekly conference in the office of the commanding officer or the executive officer that includes not only the chief of the medical professional services but also the chief nurses, the service corps representative, the heads of maintenance departments, the senior Red Cross or social worker and the chaplain is of inestimable value both in bringing about an appreciation of their several problems and in expediting their solution. In 30 years spent in civilian hospitals I have yet to hear of the first such conference attended by both lay and professional personnel. We are utilizing valuable means for improving the efficiency and the economical operation of our hospitals.

I have mentioned several committees and staff meetings. When will there be time to do one's work? The point is well taken, for such meetings can multiply to the extent of becoming unaligated nuisances. It

requires judgment on the part of the hospital administrator to keep the number of such meetings within reasonable bounds. He can also see to it that when feasible different members of the same department shall represent it on the several committees or teams. He can arrange the time and place of meetings to suit the convenience of the majority of those who need to attend. Above all it is up to the presiding member to start the meeting at the exact minute assigned and to end it with equal promptness when the business at hand is finished or the closing time arrives whichever is first. In my book that administrator ranks highest by whose arrival you can set your watch be that at a committee meeting or at meal time or in the recreation hall for the movies. My most cordial dislike has been won by those who wasted my time when I was punctual and they were late.

Up to this point, improved professional relations have been credited only with consequent improvement in professional function. It should be pointed out that *coordinated research* is a most important by-product of such team work. The Supplement to the U. S. Naval Medical Bulletin in March 1946 with its 32 articles on various aspects of rehabilitation prepared under my editorship as Rehabilitation Officer of the U. S. Naval Hospital Philadelphia is evidence of that fact.

Service hospitals have an advantage over civilian institutions in that they can explore the possibilities of improved professional relations beyond the confines of a single hospital by correlated programs in even widely separated areas. There has begun in some of our larger cities a program of interhospital activities that has far-reaching possibilities. The use of combined purchasing of various supplies is effecting significant economies in hospital operation. An even more important cooperation at the professional level is being fostered in several cities by a local *hospital planning agency*.

When there are several hospitals in the same section of a large city it is not necessary that each be prepared to offer the ultimate in every phase of medical service. A single complete department of broncho-esophagology will meet the endoscopic needs of the community. A children's hospital by entering into a professional relationship with a large general hospital at no great distance can replace the pediatric service of the latter while benefitting from other services such as irradiation therapy, neurosurgery and complicated laboratory service which the larger institution possesses. Particularly teaching hospitals can so draw into their orbit a number of outlying satellite hospitals and thereby be themselves expanded into a *medical center* that can give to its area a complete, balanced and economical service and to medical students a better chance for clinical training. This principle is also applicable to groups of hospitals of the federal services located within reasonable distances of one another.

Finally one might explore further the possibility of professional interrelationships between service hospitals and civilian hospitals in



the same means. A good beginning has already been made in this regard in the staffing of certain hospitals of the Veterans Administration under the supervision of local dental committees. In a few of these medical students are now serving as clinical clerks. The residency training programs in many service hospitals have made liberal use of certified members of the staffs of neighboring civilian hospitals. Residents of some teaching hospitals have been rotated through Army hospitals to relieve personnel shortages and at the same time to gain valuable experience. It would seem logical for service hospitals to make use of highly specialized services available in adjacent civilian institutions such as tissue culture service, a virologic laboratory, a radiotherapy unit, and many others. In return, the service hospitals could offer clinical instruction in various fields of clinical medicine such as tropical medicine, orthopedic and traumatic surgery, and those involved in groups of rehabilitation cases. Such instruction could be both at the graduate and the undergraduate level. I hope that the ever improving professional relations between physicians in federal service hospitals and their colleagues in civilian institutions will pave the way for such an expanding cooperation, to the mutual advantage of the physicians and in the interest of an improved service to our patients.

# Accomplishments of Naval Dental Research

Carl A. Schlack, *Captain, DC, U S N (1)*

**I**N 1942, an article (2) appeared describing a plan for dental research that might be undertaken in the Navy. The divisions described at that time were (1) that type of research which could be undertaken by dental officer personnel entirely on their own responsibility without support or review by the Bureau of Medicine and Surgery; (2) that in which the researcher might seek funds, material and personnel from the Bureau of Medicine and Surgery; and (3) that in which qualified dental officers and assistants participate in a master project involving many facets or phases of study in a single investigation of naval dental importance.

Since that report it has become possible for naval dental officers to be designated officially as qualified for dental research and as dental research specialists; a rating for enlisted personnel as dental research assistants has been established and physical facilities for dental research have been constructed within naval medical research institutes. Since this broad program was first planned over 100 naval dental research reports have appeared in scientific and naval publications related directly or indirectly to dental research problems of naval importance.

In 1948 an article (3) appeared describing a scientific mission that included biometrics, epidemiology, oral pathology, oral bacteriology, oral biochemistry and nutrition, oral therapeutics and prosthesis. A textbook of dental epidemiology and statistics has been drafted. Reports have appeared on surveys involving time requirements in dental treatment. Various universities have become interested in the problems of oral pathology, particularly those related to ionizing radiation phenomena as exhibited in oral tissues and fluids. Studies in oral bacteri-

(1) Dental Branch, Biological Science Division, Office of Naval Research, Washington, D. C.

(2) Schlack, C. A.: *Essentials for dental research in the Navy*. J. Dent. Ed. 7: 123-125, Dec. 1942.

(3) Schlack, C. A.: Five-year dental research program. Monthly Research Report, Office of Naval Research, Nav. ExOs P-434 38-12-15, Oct. 1947 and Jan. 1948.

ology have been made relating to dental caries and to the role of oral tissues, fluids, and structures in air, fluid, and food borne infections. A training program for personnel in dental histologic technique is contemplated because scarcity of such persons has delayed many of the studies on the hard structures of the mouth.

In 1950 the program of dental research in the Navy was consolidated under four master projects:

1 *Oral standards for service entrance (diagnosis and prognosis)* which include (a) studies leading to scientific evaluation of patient's oral health before entrance to the service which may save considerable sums of money when future rehabilitation by prosthesis or operation and hospitalization with subsequent loss of man-hours becomes necessary; (b) development of electronic measuring devices to determine chewing efficiency in the absence of several teeth and in the presence of malocclusion, and histochemical means of early diagnosis of malignancies which may permit screening as unsuitable the man who might become a non-service-connected medical burden for the remainder of his life; and (c) development of methods of analyzing results of such studies.

2 *Oral clinical treatment procedures* which include studies of (a) dental caries particularly its relation to its prevention; (b) oral rehabilitation during mobilization and the surgical treatment of war injuries; and (c) the materials used in dental treatment.

3 *Oral effects of ionizing radiations (detection and prognosis)* on (a) oral tissue; (b) fluid bacterial defense mechanisms as related to lethal and sublethal doses of ionizing radiations from any source and concomitant nutritional effects; (c) tools for contributory diagnostic and prognostic procedure to assist at least in screening casualties from atomic explosion who are beyond hope of recovery from those who might be saved; and (d) nutritional factors that might influence resistance to ionizing radiations.

4 *The role of oral tissues, fluids and structures in air, fluid and food borne infections (detection, protection, and prognosis)* including (a) mechanical; (b) biochemical; and (c) bacteriologic screening and carrier effect of oral tissues, fluids and structures.

Dental research projects falling into these categories are being supported by the Office of Naval Research (ONR) at civilian institutions some of which are joint studies with the Navy. In coordination with this program the master dental research project which have been organized within the Navy and supported by the Bureau of Medicine and Surgery are as follows: (1) oral medical research related to the modern combatant method; (2) preventive oral medicine (epidemiology, diagnosis and prognosis); and (3) technical and equipment for naval dental training and practice.

The annual report of naval dental research for the fiscal year 1950 reveals that at the Naval Medical Research Institute the Dental Division has shown that:

1 Oral effects of ionizing radiations include hemorrhages in the tongue floor of the mouth and mucosa of the hard palate. There were evidences of destruction of ameloblasts and halts in amelification differing from that seen ordinarily in hypoplasia produced by other means. It is still not certain whether the dental defects were caused by local effects of ionizing radiation on the developing tooth germ or whether indirectly by injuries to some of the endocrine glands associated with calcification such as the thyroids, the parathyroids, and the pituitary. This work was conducted on animals who received lethal and sublethal doses of ionizing radiations.

2 The weight of food intake, water intake, gains in weight, and male and female hormones of animals apparently had no effect on the production of dental caries in the strain of rodents developed by the Dental Division, Naval Medical Research Institute.

3 Bilateral symmetry of dental caries was observed in only about 70 percent of a series of carefully controlled rodents. This may influence the results obtained in application of various preventive measures in which the right or the left side of the mouth is used as a control.

4 Field tests on intraoral photographic apparatus designed to make records of dental arches for use in personnel identification have shown that a prototype apparatus is about ready for production.

5 A review of the dental literature shows that little scientific information is available on the defense mechanism of the oral cavity against airborne infections.

At Great Lakes Naval Training Center, the most effective antibiotic used locally in a dentifrice to prevent dental caries seemed to be penicillin as measured by lactobacillus counts. The use of the lactobacillus count for this purpose, however, was found to be rather inexact. Studies in oral fusospirochetosis (trench mouth) revealed that this disease is not as common as generally supposed when critical clinical criteria are applied in diagnosis.

Support given at Corpus Christi on the development of air abrasives as a means of tooth cavity preparation instead of the revolving burr did much to focus attention on this method of cavity preparation.

Other studies have revealed that temporomandibular joint disturbances may be caused by malocclusion.

A method has been devised whereby the change in oral flora may be measured when experimental animals are subject to controlled quantities of airborne infectious organisms inhaled over unit time.

Cold weather studies revealed no more than the usual dental pains associated with dental disease in patients exposed to arctic conditions. Dental medicaments, equipment, and instruments generally are not affected by cold, and breakage of glass containers caused by freezing of their liquid contents can be controlled by reducing the volume of liquid in the containers.

In the annual report of the Dental Branch, ONR, for 1950 the following progress has been reported:

The masticatory efficiency studies have reached a stage where field tests are indicated. The several electronic devices constructed have been used to measure chewing efficiency and forces and the factors influencing them. The results applied to naval dental problems promise a means for a more scientific appraisal of the denture needs of service personnel. Records so obtained should assist in evaluating future service-connected denture construction claims when such tooth replacement requirements may have existed prior to entrance in the service. It is estimated that a 20 percent reduction in denture construction may be effected by the use of such means.

Contributions have been made to methods of more accurate diagnosis of precancerous oral lesion.

Other studies have revealed that acid beverages might best be reduced at naval installations and a palatable milk drink substituted in order to reduce potential tooth destruction.

The commercial claims for efficacy in preventing caries by means of fluorinated toothpastes and powders have been shown to be exaggerated.

The strength of filling materials and other materials used in dentistry should be evaluated by clinical trial rather than laboratory control test, which omits factors operating in a regular clinical practice. The results obtained have contributed to a more scientific procurement schedule.

Additional oral bacterial studies in germ-free animals have again shown that bacteria are necessary in the tooth decaying process. These methods should contribute to a more exact approach to the determination of what mechanisms are operating in tooth decay. Further studies have shown that bacteria placed in various tissue areas of the mouth are transferred to other tissue areas and disappear at different rates. The studies are contributing much to our understanding of what happens to germs which enter our mouth from the air, water, or food, how diseases spread from one person to another, and what diseases may be spread by way of the mouth.

Preliminary research on the oral effects of ionizing radiation indicates that some changes occur in saliva when subjected to x-rays in vitro.

Dental research conducted within the Navy by naval personnel which represents pioneer investigation through studies of the oral tissues fluids and structures of naval recruits and experimental animals includes:

1 The direct study on the yearly increment of dental caries in adults done aboard ships and found to be about 1.2 cavity per person per year

2 Biostatistical analysis of influences of place of birth on the incidence of dental caries in adults; correlations of dental treatment needs and place of birth, income per capita and dental treatment needs; income per capita and treatment rendered; dental treatment needs and dentist distribution, dentist distribution and income per capita. The results showed that civilian dentists were not distributed according to the dental treatment needs of the population but according to their income per capita and that those recruits who were born in locations where the income per capita was greatest showed the greatest amount of dental treatment. Recruits born in the East South Central and West South Central Areas showed the fewest dental defects and those born in the New England and Middle Atlantic areas showed the most dental defects. A dentist man-hour requirement per person was calculated which figure may be used to determine the number of naval dentists required to render a *complete* dental treatment service based on real rather than estimated factors. This made it plain that there could never be a sufficient number of dentists available to render a complete dental service to all naval personnel if dental standards for entrance into the service are low or nonexistent and that some compromise would have to be reached on the amount and type of dental treatment the naval Dental Corps can be expected to render.

3 A study of mass dental treatment methods in adults

4 A study of audio-visual as well as other improved educational methods for dental training

5 Identification of naval personnel by inserting their names in the substance of the denture material and mass intraoral photography

6 A study of the influences of vibration ordinarily encountered in propeller-driven aircraft and different barometric pressures on dental structures and their associated tissues and factors operating in dental pain experienced in some aviators while flying at high altitudes and its control

7 Nutritional studies on rodents contributing to further knowledge on the effect of acid beverages; development of measurement means and factors influencing the reduction of such effects

8. A study of the effects of gains in weight, quantity of diet, amount of water and the inclusion of endocrine substance in the diet on the incidence of dental caries in rodents all of which are important in the standardization of factors operating in the production of dental caries

in rodents specifically in that strain developed by the Naval Medical Research Institute and the possible role of oral tissues fluids and structures in the detection and prognosis of biophysical influences such as irradiation, chemical substances and other military combat methods.

9 Basic studies on a method of clinically determining the number of glands in the oral mucosa keratinization of oral mucosa in specific areas by the technique of tissue smear and special staining developed by others effect of simple drying of the oral mucosa by unsterile air blast on colony counts from such areas. If these studies conducted in 1941 and 1942 had been continued they would have contributed much to the present knowledge required of the bacterial defense mechanism of and predisposing factors operating in the mouth.

10 The first studies on the effect of human saliva on the cholera vibrio conducted in Egypt during the last cholera epidemic in which a trend was found in the possible use of saliva as contributing index of the relative immunity and susceptibility of person to cholera.

11 A search for improvements in dental prosthetic and oral surgical treatment procedure.

12 A study of dental equipment and office housing for specific naval purposes.

13. Standardization of organization in dental research laboratories within the Navy where more than one person is conducting oral medical research and the efforts of those trained in the various sciences are coordinated.

## CONCLUSIONS

A coordinated drive has been organized to solve or at least mitigate studies in many of the oral medical problems that have naval importance and excellent progress has been made in accomplishing the original plan for naval dental research.

# Decompression Sickness

## Report of Two Unusual Cases

Walter Welham *Commander MC, U S N.* (1)

Charles L. Walie *Lieutenant, MC, U S N R.* (1)

**D**ECOMPRESSIO*N* sickness is a condition resulting from too rapid a decompression in a person exposed to increased air pressure.

This rapid change in ambient pressure causes the formation of gas bubbles in the blood vessels and other body tissues resulting in an impairment of the circulation. When the diver is surrounded by air most of these bubbles are of nitrogen. The obstruction thus formed can cause pain mottling of the skin, weakness asphyxia paralysis and even death. This condition is commonly encountered by naval deep-sea divers and aviators. Bert (2) experimentally producing decompression sickness in animals found that the condition was caused by bubbles of gas forming in the tissues and that there was a definite relation between the location of the bubbles and the location of the clinical signs. Hill and Macleod (3) also demonstrated the formation of bubbles in the capillaries of the web of a frog a foot when these animals were rapidly decompressed from high atmospheric pressures. As a possible preventive of this formation of bubbles Bert recommended a gradual and steady decompression but this proved to be ineffective.

It remained for Boycott et al (4) to provide the first successful method for safe decompression. This stage method, as it is called, was founded on the following scientific reasoning. Dives at depths greater than 33 feet of sea water (pressure of 2 g) are possible because inert nitrogen is absorbed by the body tissues and these tissues are able to hold excess nitrogen in supersaturation. If this were not so any attempt at ascent by a diver would result in the immediate formation of bubbles

(1) Experimental Diving Unit, U S. Naval Gun Factory Washington D C.

(2) Bert, P. *La pression barometrique; recherches de physiologie experimentale* Paris G. Masson 1878, II, pp. 1168 (English trans Barometric Pressure Researches Experimental Physiology Translated from the French by Mary Alice Hitchcock and Fred A Hitchcock. College Book Co. Columbus Ohio 1943).

(3) Hill, L. and Macleod, J J R. *Cais on disease and diver' palsy: experimental study* J Hygiene 3: 401-445 1903.

(4) Boycott, A. E., Damant, G. C. C., and Haldan J S. J Hygiene 8: 242 1908.



and serious decompression sickness would ensue. From the study of many clinical cases and some laboratory evidence these investigators noted that when the excess atmospheric pressure did not exceed 2.25 g (41 feet), the diver or laboratory animal was completely immune from symptoms caused by bubble formation. That is to say either the bubbles were sufficiently small to pass through the narrowest capillary or no bubbles formed.

Because the volume of nitrogen released when the total pressure is halved remains the same whether that total pressure be high or low (Henry's Law), Haldane postulated that it would be just as safe to diminish the pressure rapidly from 6 to 3 g as from 2 to 1 g. If this proved to be the case then a stage system of decompression using the 2:1 ratio could be safely used. With this method the diver could rid himself of excess nitrogen through his lungs at far greater rate than if Bert's gradual method was used, with the added advantage of shorter decompression times. The theory of the 2:1 ratio was put to the test first using goats and then human subjects. These trials were successful and prompted Haldane to state: "There were no ill effects in a number of experiments nor in subsequent trials at sea, and rapid decompression to half the absolute pressure is now the routine practice of divers and it is not known to have ever resulted in harm." (4)

The present U. S. Navy Standard Decompression Tables calculated and proved by Yarbrough et al. (5) are based on the 2:1 ratio and thousands of successful dives have been made using these tables as a guide. A 5 percent incidence of bends is expected even when they are used properly. Most of this 5 percent occur after dives at depths greater than 225 feet or at shallower depths for long periods of time. This latter type of dive is called a saturation dive. Decompression sickness occasionally occurs following dives at depths greater than 225 feet because the limiting ratio of slower saturating tissues drops to 1:75:1 or lower (5), and following the saturation dives because a large amount of gas has been absorbed even at the shallower depth when the diving time is prolonged. Van Der Aue (6), while conducting experiments to determine the effect of exercise on the incidence of decompression sickness, subjected 8 divers to a depth of 33 feet for 24 hours. Four of these divers did no work and the other 4 worked a standard alternate periods. None of these men developed any symptoms or signs of decompression sickness but 2 of another group of 8 divers suffered from bends after diving to a depth of 33 feet for the same period of time. One of these was in the resting group and one was in the working group. Thousands of simulated submarine escapes from a depth of 100 feet have been made by men using the Mohnsen lung. One

(3) Yarbrough, O. O. Calculation of decompression tables. Experimental Diving Unit, U. S. Naval Gun Factory, Washington, D. C., 1937.

(4) Van Der Aue, O. E., Keller, R. J., and Prutton, E. S. Effect of exercise during decompression from increased barometric pressure on incidence of decompression sickness. U. S. Navy Report No. 8-47 Mar. 1949. Experimental Diving Unit, Washington, D. C.

of these men suffered from bends. This ascent from a depth of 100 feet after a short exposure with no decompression time is based on figures derived from the 2:1 ratio and seems to further validate its efficacy.

Within the past 2 years at the Experimental Diving Unit there have been 2 cases of decompression sickness complicating dives both of which were made at depths of less than 30 feet and for periods of less than 2 hours.

### CASE REPORTS

**Case 1**—A 21-year-old student diver reported to the Diving School at 0200 on 21 September 1949 complaining of pain, weakness and numbness of the right arm and shoulder and mottling of the right arm. The onset had been fairly sudden and had occurred 2 hours before he reported for treatment. He had made his last dive 36 hours prior to the onset of symptoms. This moderately heavy working dive was made at a depth of between 25 and 30 feet. Examination revealed some weakness of the right arm and mottling of the skin extending from the wrist to the shoulder. The patient was recompressed and relief of all symptoms occurred at a depth of 20 feet. He was brought to the surface several minutes later and remained symptom free for 1 hour then all of his symptoms returned. He was recompressed in accordance with Treatment Table 1 (Diving Manual) and was brought to the surface symptom free. There was no recurrence. He had made several dives in the previous week with proper decompression and had had no difficulties.

**Case 2**—A 24-year-old student diver made a dive to a depth of about 27 feet for a period of 96 minutes while performing heavy work. About 7 hours after he returned to the surface he noticed a sharp pain in his right wrist. Because of the shallow depth at which he had been diving, he did not associate this pain with decompression sickness. He applied hot soaks with no relief. He reported to the Diving School at 2230 and consulted a medical officer who recommended treatment by pressure. Complete relief was obtained at a depth of 56 feet and treatment was carried out in accordance with Treatment Table 1. The patient returned to the surface symptom free and was placed under observation. About 21 hours after initial treatment he again complained of pain in the wrist. This at first was thought to be a recurrence but when he received no relief after 30 minutes at a depth of 165 feet it became apparent that this was not the bends. After he was returned to the surface in accordance with Treatment Table 2 a complete re-examination was made and the diagnosis of possible tissue damage following decompression sickness was made. He was admitted to the U S Naval Hospital Bethesda Md. for diagnosis and treatment. Roentgenograms revealed no evidence of fracture and a diagnosis of sprain was made. After 14 days in the hospital he was discharged to duty symptom free.

**Comment.**—This patient undoubtedly had decompression sickness to begin with as shown by the dramatic initial relief under pressure.

The subsequent pain at first thought to be a recurrence was most likely a reaction to tissue damage incurred by the initial illness. The factors in favor of this diagnosis are failure to obtain relief within 30 minutes at a depth of 165 feet; augmentation of the pain under pressure and the time of onset. The diagnosis of sprain made at the hospital is probably not entirely accurate. The symptoms and signs of tissue damage following the bends are similar to those of sprain.

#### DISCUSSION

Anyone who has been exposed to increased air pressures has excess gas in solution in the tissues and may therefore develop decompression sickness. In the shallow dives for short periods of time as in the two cases reported, the probability is very slight, but, nevertheless it can occur. Therefore in treating anyone with clinical symptoms following exposure to increased air pressures it is imperative that decompression sickness be considered in the differential diagnosis.

# Liver Suture

Richard S. Silvia, *Captain, MC U S N*

**A**DEQUATE suture material for repair of lacerations of the liver is not available at present. Lacerating fragment wounds of the liver requiring definitive suturing are common in combat. The Korean conflict and the present international situation lend import to an injury that is comparatively rare in peacetime. Ribbon catgut was developed years ago by urologists for suture of the kidney. While admirable for this purpose, it is swaged on an atraumatic needle that is too small for the repair of most liver lacerations. The atraumatic needle provided is excellent for placing a running suture to close the superficial margins of the laceration, but does not permit approximation in the depths of the wound.

The only available needle of sufficient length with an eye large enough to permit the threading of ribbon catgut is the autopsy needle. By rounding the point and grinding the cutting edges of this needle on an emery wheel, a needle well suited for suturing the liver is produced (fig. 1). The grinding process decreases the temper of the needle, thus enabling the surgeon to bend it manually to any curve required. This suture (1) permits rapid repair of a liver laceration (2) allows adherence to the basic surgical principle of closing a laceration from its depths outward (3) eliminates the possibility of the suture cutting through the liver (4) insures firm closure of the defect and (5) accomplishes hemostasis. Simple interrupted mattress and running sutures may be employed as indicated. An atraumatic ribbon catgut suture swaged on the modified needle would be preferable and such should be produced and made available.

## TECHNICAL CONSIDERATIONS

Methods of suturing liver lacerations in common use today require a mattress suture with strips of muscle or fat in the bights of the suture. This process is time consuming. The segment of muscle or fat may be misplaced, dropped, or inadvertently discarded during the placing of the mattress suture. Furthermore, it is technically difficult to place the muscle or fat in the bight of the suture when repairing a laceration high on the dome of the right lobe of the liver. The use of gel foam, fibrin foam, or muscle in the depths of a laceration is an adjunct, but does not replace anatomic suture of the defect. Gauze packing is



Figure 1.—Ribbon catgut threaded on autopsy needle

ment need only to condemn the procedure although it may be lifesaving in extreme cases particularly if ribbon catgut on long needle is not available.

Major hemorrhage from the liver during the repair may be greatly decreased by compression of the hepatic artery and portal vein. This is expeditiously performed if the first assistant places his left index finger in the foramen of Winslow and compresses the vessels between his finger and thumb, thus providing an open field and freedom of motion for the operator. The repair of a deep laceration of the dome of the right lobe of the liver (the most frequent site of rupture caused by penetrating missiles) may be technically easy by the use of long needle holder, a long blunt needle and ribbon catgut. A left lobe hepatectomy, the procedure of choice in the event the left lobe of the liver is severely lacerated or crushed. The suture material chosen for these operations is its use in partial hepatectomy facilitates the repair and curtails hemorrhage. Drainage preferably with one or more soft Penrose drains is advocated following the repair of major liver lacerations.

A summary of 16 case reports involving rupture of the liver is shown in Table I. Five of the 9 patients sustaining such major lacerations in combat incurred laceration of other organs or viscera. A brief report

TABLE I—Summary of 16 case reports involving suture of the liver

Case	Age	Year	Place where injury occurred	Agent	Injury	Associated injury	Ribbed castig used	Losses used	Result
1	19	1945	Iwo Jima	Shell fragment	Laceration of right lobe	P. forelimb of colo	No	No	Recovered
2	21	1945	Iwo Jima	Shell fragment	Laceration of right lobe		No	No	Recovered
3	20	1945	Iwo Jima	Shell fragment	Laceration of left lobe	Perforation of jejunum	No	N	Recovered
4	24	1945	Iwo Jima	Shell fragment	Laceration of right lobe, multiple	Laceration of right kidney	No	No	Died
5	26	1945	Iwo Jima	Shell fragment	Laceration of right lobe	Laceration of right lung	N	No	Recovered
6	21	1945	Iwo Jima	Shell fragment	Laceration of left lobe	Perforation of tom ch	No	No	Recovered
7	26	1946	San Diego, Calif	Automobile	Laceration of left lobe		Yes	No	Recovered
8	28	1947	San Diego, Calif	Automobile	Rupture of right lobe		Y	No	Died
9	31	1947	San Diego, Calif	Pell	Rupture of right lobe		Y	N	Recovered
10	17	1948	San Diego, Calif	Automobile	Rupture of right lobe	Contusion of right lung	Y	No	Recovered
11	33	1948	San Diego, Calif	Kali	Rupture of right lobe		Y	No	Recovered
12	38	1949	San Diego, Calif	Automobile	Rupture of right lobe		Y	Y	Recovered
13	43	1950	St. Albans, N. Y.	Tumor	Major aortic aneurysm of left lobe		Y	Y	Recovered
14	23	1950	Korea	Shell fragment	Laceration of right lobe		No	No	Recovered
15	21	1950	Korea	Shell fragment	Laceration of right lobe	Laceration of gallbladder	No	No	Died
16	22	1950	Korea	Shell fragment	Laceration of left lobe		No	No	Recovered

Eleven patients with small lacerations of the liver resulting from shell fragments or bullet wound which were repaired during more extensive abdominal procedures are not included in this series.

of the patients who died present unusual problems or illustrated certain technical points is presented.

### CASE REPORTS

**Case 4.**—A 24-year-old marine was brought to the Division Hospital 4 hours after being wounded. He had received 16 mg of morphin sulfate and 500 cc of plasma. Examination revealed intense florid, thready pulse of 132 per minute and blood pressure of 80/30. There was an irregular penetrating wound 3 cm. in diameter on the right flank surrounded by numerous smaller fragment wounds. Two thousand cubic centimeters of whole blood was administered rapidly via the femoral veins. Under ether anesthesia a vertical transverse incision was made in the right upper abdominal quadrant. The peritoneal cavity was filled with blood. The lacerated bleeding right lobe of the liver was temporarily packed. A right nephrectomy was performed because of severely lacerated kidney. Repair of multiple deep lacerations of the right lobe of the liver was performed with mattress sutures of No. 0 chromic catgut placing a portion of muscle in the depths of the suture. Fibrin foam was inserted into the lacerations prior to suture. A Penrose drain was placed beneath the liver and the abdominal incision was closed in layers.

An additional 3,000 cc of whole blood was administered during the operation and the subsequent 24 hours. The patient recovered from shock and was evacuated by boat on the second postoperative day in fair condition. The pulse was 90 and the blood pressure 116/70. On the sixth postoperative day severe shock recurred and the patient died shortly thereafter. Postmortem examination revealed about 900 cc of blood in the peritoneal cavity. The ligation of the renal vessels were intact. There were thick blood clots over the right lobe of the liver, the evidence of recent hemorrhage.

**Comment.**—Although the lacerations of the liver were extensive, this patient might have been saved had the suture shown in figure 1 been usable.

**Case 5.**—A 28-year-old sailor entered U. S. Naval Hospital 13 hours following an automobile accident. He was treated expectantly and symptomatically in an orthopedic ward for 20 hours when signs of intraperitoneal hemorrhage became manifest. Following the administration of 500 cc of whole blood an operation was performed. The peritoneal cavity contained about 500 cc of blood. There was a deep laceration 10 cm. long running in an anteroposterior direction over the dome of the right lobe of the liver. Fibrin foam was inserted into the depth of the laceration. Two mattress sutures of No. 0 chromic catgut were placed with portions of muscle in the depths of the suture and tied. The superficial edge of the laceration was closed with ribbon catgut sutured on the small or urinary kidney needle. Hemostasis was complete. The incision was closed in layers.

The patient made a rapid and uncomplicated recovery. The incision healed by primary union. By the tenth postoperative day he was asymptomatic. The erythrocyte count was 4 700 000. On the twenty fifth postoperative day the patient complained of malaise and a dull pain over his right flank. Examination revealed no abnormal findings except that the temperature was 99.6° F. He was returned to bed and treated symptomatically. During the ensuing week his symptoms and low grade fever persisted. His erythrocyte count was 4 600 000 and his leukocyte count 10 100. On the afternoon of the thirty-second postoperative day while walking around his room he suddenly became faint and collapsed.

Examination revealed the symptoms of severe shock. His pulse was 112. His blood pressure was 110/60. The abdomen was tender over the upper quadrant. One thousand cubic centimeters of whole blood was administered and an operation was performed 2 hours later. The peritoneal cavity contained about 800 cc. of fresh blood. Massive adhesions and organized and fresh blood clots extended over the dome of the right lobe of the liver. No definite point of hemorrhage could be seen. Fibrin foam was placed over the dome of the liver and the abdominal incision was closed. Five hours postoperatively severe shock suddenly ensued and the patient died.

Postmortem examination revealed a huge cavity 6 cm. in diameter in the right lobe of the liver deep to the site of the old laceration. This cavity communicated directly with the hepatic vein and was filled with fresh blood cultures of which were negative. The previously sutured area over the cavity representing a thickness of 2 cm. of liver tissue was intact except for a small area at the posterior end of the laceration through which the recent hemorrhage had occurred.

*Comment.*—This unusual case graphically illustrates the surgical principle that lacerations of the liver should be approximated anatomically from the depths to the surface. Ribbon catgut on a long needle would have made deep firm sutures possible which might have prevented cavity formation secondary hemorrhage and death in this case.

*Case 10.*—A 17-year-old boy entered a U. S. naval hospital in severe shock with a ruptured right liver and contusion of the right lung 1 hour following an automobile accident. Because of severe dyspnea and hemoptysis tracheal intubation and aspiration was performed. Continuous oxygen inhalation and 1 000 cc. of whole blood were administered. Operation was performed under local anesthesia using intercostal block with 1 percent procaine. A linear laceration 5 cm. long on the dome of the right lobe of the liver was repaired using mattress sutures of No. 0 chromic catgut with pieces of muscle in the bight of the suture. The superficial portion of the laceration was closed with a running suture of ribbon catgut swaged on an atraumatic kidney needle. The abdominal incision was closed in layers without drainage.





# Clinicopathologic Conference<sup>(1)</sup>

CAPTAIN W. J. SAYER. A 36-year-old white officer previously in excellent health was admitted to this hospital on 1 January with a diagnosis of a gastrointestinal condition acute type undetermined. He was complaining of loss of 25 pounds in the previous 3 months; general weakness; intermittent dull aching pains in the calves of his legs, knees and wrists of 1 month's duration; and mild dull epigastric and substernal pains and anorexia of 4 days' duration. The epigastric and substernal pain was constant, poorly localized, did not radiate, came on immediately after eating and was partially relieved in 15 to 30 minutes by taking some pills that were given to him by a local physician. His food habits were normal prior to his present illness. Eighteen months prior to admission he had developed hemorrhoids which bled occasionally. History pertaining to other systems was negative except for occasional headaches.

Physical examination revealed his temperature to be 100.2° F, pulse 100, respirations 22; blood pressure 156/100. Murphy's sign (cessation of respiration when the fingers are pressed deeply into the right upper abdominal quadrant following forcible expiration) was slightly positive. Proctoscopic examination revealed no lesions except thrombotic external hemorrhoids. His abdomen was soft and slightly distended. Voluntary muscular rigidity was present over the upper portion of his abdomen. His liver and spleen were not palpable. A slight tenderness was present in his epigastrium and in his left lower abdominal quadrant. He appeared thin, emaciated, and markedly anemic.

On admission the red blood cell count was 3,450,000. The hemoglobin was 70 percent. The white blood cell count was 21,300 with 80 percent neutrophils and 4 percent eosinophils. Three weeks later the red blood cell count was 3,890,000. The hemoglobin was 65 percent. The white blood cell count was 13,200 with 16 percent lymphocytes, 73 percent neutrophils, 9 percent eosinophils and 2 percent monocytes. The platelet count was 250,000. There were 0.8 percent reticulocytes. Red blood

(1) From the Walter Reed Army Hospital, Washington, D. C.

cell count showed slight polychromasia and slight achromia. Three weeks later the red blood cell count was 3 000 000 with 60 percent hemoglobin and the white blood cell count was 7,500 with 80 percent neutrophils 14 percent lymphocytes and 6 percent eosinophils. The sedimentation rate was 30. The Kahn test was negative. The agglutination tests for *Salmonella typhi*, "O" and "H" and *Brucella abortus* were negative. A blood culture shortly after admission was negative. During the sixth week in the hospital the blood sugar was 135 mg. per 100 cc., urea nitrogen 28.8 mg. per 100 cc., potassium 17 and calcium 10.7 mg. per 100 cc. Urinalysis on admission showed one plus albumin with occasional red blood cells. Examinations during the second and fifth weeks showed about 12 red blood cells per high-power field and occasional granular and hyaline casts. The feces were positive for occult blood. The sputum was negative for acid-fast bacilli. The total acid values of gastric analysis were 35 70 60 and 70 and free HCl 25 15 40 and 50.

Barium enema, cholecystogram and gastrointestinal series were negative. Roentgenograms of the chest 10 and again 17 days after admission were negative. One month after admission there was an advanced degree of pulmonary infiltration closely associated with truncal shadows most marked in the hilar region. The process was evenly distributed throughout the lungs suggestive of a lymphogenous spread of a malignant process. The skull and pelvic bones were negative.

When the patient was first admitted the symptoms suggested a diagnosis and he was treated accordingly without benefit. He continued to lose weight and became weaker. Three weeks after admission he was noted to have a wrist drop in addition to marked weakness of the right leg and arm. He was found to have anesthesia of both feet and of the lower portion of his right leg. His right knee and ankle jerks were absent. A tentative diagnosis of peripheral neuritis was made. Five and a half weeks after admission he appeared dyspneic but was not cyanotic. At this time his temperature pulse and respirations were 98 F., 94 and 28 respectively. His blood pressure was 145/90. He developed a purpuric rash which disappeared on pressure and was most marked over the lateral aspect of his chest. Tinkle fremitus became marked and his chest was hyperresonant anteriorly but some dullness was noted along the right costal margin at the level of his eighth rib. His breath sounds were loud and there were coarse inspiratory rales in the upper portion of his left axilla and in the base of both lungs laterally. His heart sounds were faint, rapid and regular. He was placed in an oxygen tent. On the following day he developed signs and symptoms which were considered to be characteristic of acute surgical abdomen within the abdomen. A roentgenogram showed free air under his diaphragm on the right side. An exploratory laparotomy was performed. At the perforation the lower lumen was repaired the abdomen was drained and the patient was given 500 cc. of blood. His postoperative course was progressive and he died 23 hours after the operation.

On reviewing this patient's history it would be pertinent to know what drug therapy had been used what diseases he had been exposed to what his hobbies were and where he had lived within the continental limits of the United States. The evidence would be suggestive if he had hunted or skinned rabbits or if he had lived or visited in the San Joaquin Valley. The sudden onset of hemorrhoids 18 months prior to admission is suggestive of disease in the upper gastrointestinal tract. Perhaps the patient merely changed occupation and became more "bowel conscious." A 25-lb. weight loss in the 3 months prior to admission without other symptoms should direct immediate attention to the neoplastic, metabolic infectious, and collagen diseases. The arthralgia with pains in the calves of the legs raises the question as to whether these symptoms were caused by primary organic disease at these sites, metastatic disease or whether they were systemic or concomitant with general disease. For example these are common complaints in anemia and cachectic diseases.

In relation to the epigastric pain neither inciting factors nor relieving factors were noted except slight relief from use of "pills." This is of little help because no peptic ulcer has been cured and very few helped by the administration of pills alone. With definite evidence of gastrointestinal disease we should consider gastric malignancy and peptic ulcer. Although the familiar cycle of pain food and relief are typical of peptic ulcers many patients give no history of such a cycle. In the absence of nausea vomiting dysphagia hematemesis, and melena and with pain alone as the presenting complaint a cause other than peptic ulcer should be sought. Other possibilities are acute gastritis and a fairly infrequent pathologic entity prolapse of the gastric mucosa through the pylorus. This is extremely difficult to demonstrate roentgenologically and the symptoms vary widely. The location and duration of the patient's vague headaches should be known.

As regards the physical findings it would be interesting to know how long this patient had his hypertension which may have accounted for his headaches. His vague abdominal tenderness substantiates the impression of gastrointestinal disease. The laboratory findings revealed progressive anemia which may be accounted for on the basis of bone marrow involvement or chronic bleeding. Blood indexes should have been obtained in this case but (1) the lack of disparity between the red blood cell count and the hemoglobin (2) the polychromasia and (3) the hypochromia suggest an orderly red blood cell generation and helps to rule out primary bone marrow involvement or primary blood dyscrasia. Bone marrow studies would have settled this question. A persistent leukocytosis with elevation of the sedimentation rate predominance of neutrophils even when the total count reached normal limits might indicate an infectious process or a cachectic state. An eosinophilia was noted and we should know whether this was maintained in later counts not reported in the protocol.

MAJOR JAMES L. HANSEN (2) Repeated counts showed a constant eosinophilia.

CAPTAIN SAYER This directs our attention to allergic states, parasitic infections and Hodgkin's disease. An agglutination test, for *Pasteurella t. lewisii* and more than one blood culture should have been made. A blood sugar of 135 mg. per 100 cc. if at a fasting level and if not preceded by intravenous dextrose is suggestive of pancreatic involvement. A glucose tolerance curve would have been of value but the patient's condition at this time did not warrant such a study. A blood urea nitrogen of 28.8 mg. per 100 cc. is at the upper limit of normal but within the range of laboratory error. It repeated and found to be of the same level is suggestive of renal urea nitrogen retention. The urinalyses showed progressive albuminuria with occasional granular and hyaline casts and microscopic hematuria. Because all urines at this hospital are examined microscopically after centrifugation the amount of hematuria here is significant. The specific gravities have been omitted but are necessary in judging renal function. I should have liked a Fiske-Berg concentration test at least as a prognostic aid. Addison counts would have been of value and uric acid tolerance test would have given more information as to the amount of renal involvement. In the presence of hypertension and in the absence of pyrexia the findings are suggestive of a diffuse glomerulonephritis of the type that follows streptococcal infections or scarlet fever. The occult blood in the feces may have come from rectitis, the patient's diet or from hemorrhoids. The sputum was negative for acid-fast bacilli on several examinations. Were any gastric washings examined?

MAJOR HANSEN Yes, and they were reported negative.

CAPTAIN SAYER Intradermal tuberculin testing should have been done. Also the roentgenographic findings were compatible with pericarditis in addition to being suggestive of lymphogenous spread of a malignant process. That chemotherapy was given?

MAJOR HANSEN Sulfadiazine and penicillin.

CAPTAIN SAYER The fact that symptomatic care and routine chemotherapy were ordered is to be highly criticized in any case, and particularly in this case in which the diagnosis was not clear. The routine administration of a sulfonamide is becoming less frequent. The evaluation of routine chemotherapy are numerous and suffice it to say that only the careful bacteriologic studies in the administration of antibiotics is needed. In my effort the patient failed to respond to penicillin and sulfadiazine. The new findings are consistent with pericarditis, but the diffuse and spot involvement of the myocardium. The chest findings indicate extensive consolidation. A pneumonia was not of the type of atypical pneumonia used. Heart sound were

faint, rapid and regular. The rales present in the base of both lungs could have resulted from the consolidation, the congestive failure or both. The likelihood of the latter is great.

Paramount in considering this case as a whole with the gastrointestinal, renal pulmonary central nervous system and hematologic involvement are the collagen diseases. With our better knowledge of the manifestations of this group of diseases the ante-mortem diagnosis is being made much more frequently. In a symposium on periarteritis nodosa (3) 30 patients were studied from the renal gastrointestinal pulmonary and neurologic viewpoints. In these patients some of the highlights of the renal aspects were (1) no correlation between clinical evidence and the degree of pathologic change (2) the development of hypertension without demonstrable pathologic change (3) renal involvement was frequent and renal insufficiency alone was the cause of death in one-third of the patients studied. Seventy six percent of the 30 patients had gastrointestinal symptoms. 69 percent had pathologic involvement of abdominal viscera. Eight of the 30 patients showed involvement of both the arterioles and the parenchyma of the lungs consisting of perivascular pneumonia or multiple diffuse granulomata and scarring. Peripheral neuritis occurred in 52 percent of the series. The average duration of the disease in those who developed peripheral neuritis was 5.3 months. Histologic data indicates that the degeneration of the peripheral nerves in this disease is entirely on a vascular occlusive basis. The close parallel between these 30 patients and the case under consideration inclines me to a diagnosis of periarteritis nodosa.

The sulfadiazine that this patient received may have aggravated his disease (4).

COLONEL VIRGIL H. CORNELL (5) Captain Alvord will discuss the neurologic findings in this case.

CAPTAIN ELLSWORTH C. ALVORD JR. This patient seemed to have had a peripheral neuritis involving both upper and lower extremities. It is convenient to divide peripheral neuritis into mononeuritis or polyneuritis. Mononeuritis is usually caused by a local factor such as a tumor, trauma, or pressure and is seen in such neuritides as sciatica, neuralgia parasthetica, Bell's palsy, Saturday night palsy, and occasionally those associated with diphtheria or syphilis. Polyneuritis is usually caused by the allergic diseases, the collagen diseases and the virus and toxic diseases. The most likely cause in this case is one of the collagen diseases involving the nutrient arteries of the peripheral nerves. In my opinion this is a case of periarteritis nodosa.

(3) Heck, F. J.; Ralston, D. E.; et al. Symposium on periarteritis nodosa. Proc. Staff Meet. Mayo Clin. 24: 17-52, Jan. 19 1949.

(4) Gelfand, M. L., and Aronoff, S. Periarteritis nodosa, possible relation to the occurrence of sulfonamide. Ann. Int. Med. 30: 919-924, May 1949.

(5) Chief Laboratory Service.

COLONEL CORNELL. I would like to have a representative of the Surgical Service discuss this case from the viewpoint of the patient as a surgical risk.

MAJOR CARL W HUGHES. Although this patient was definitely not a good surgical risk he had a perforated viscus and had to be operated on as an emergency.

COLONEL PAUL S FANCHER (6): Was there any reference in the report from the Mayo Clinic as to the frequency of perforation of the bowels in this disease?

CAPTAIN SAYER. Perforation of the ileum was noted in 6 percent of the 30 cases. There was also one perforation of the gallbladder.

MAJOR LORENZ F ZIMMERMAN (7). Today periarthritis nodosa is most always diagnosed in clinicopathologic conferences which shows that we are all becoming aware of it. Lead poisoning and porphyria should have been considered in this case. I would like to criticize the use of the term collagen disease because although collagen is the matrix of fibroblasts these are not the only elements affected in these diseases. Such tissues as muscle bone cartilage synovium the cells of the endothelium and the reticulo-endothelial system are likewise affected. In view of these facts the term collagen disease is too confusing because it is made out of only one cellular element affected in this group of diseases.

CAPTAIN SAYER. At the onset of the disease the multiplicity of symptom suggested diffuse vascular disease. In lead poisoning and porphyria the combination of lung blood, nerve and renal involvement does not occur.

COLONEL CORNELL. The pathologist will give the postmortem findings.

MAJOR HANSEN. The autopsy revealed a emaciated white man with right rectus abdominis incision and drainage incision with three rubber drains in the left lower abdominal quadrant. There was laceration of the right great toe. The superficial cervical axillary and axillary lymph nodes were large and palpable. The abdominal cavity contained 500 cc of blue-gray creamy pus with generalized peritonitis. There was 400 cc of fluid in each thoracic cavity and 200 cc in the pericardium. The heart was grossly normal except for hypertrophy about the coronary vessels. Microscopically there were scattered foci of fibrin in the pericardium. About the vessels there was fibrin and fibrin on which extended through part of the vessel wall. There was marked endothelial proliferation. The great vessels were arteriosclerotic and the lumens were occluded by an acute-on-chronic thrombus. The left lung weighed 875 grams and the right lung weighed 875 grams.

(6) Chief of Medical Service

(7) Laboratory Service

Both lungs were congested edematous and had linear streaks of fibrosis. Microscopically all the fibrosis was about the arteries. The most severe changes were about and in the medium-sized arteries which were thickened with intimal proliferation and arteritis. The alveoli had become epithelized and contained pigment laden macrophages. There were small areas of bronchopneumonia and occasionally suppurative bronchitis. The liver pancreas spleen and adrenals were congested and covered with peritonitis. The vessels in these organs were similar to those previously mentioned. Each kidney weighed 200 grams. Numerous areas of ischemic infarction mainly in the cortex varied from early degeneration to fibrosis. Some small arteries were occluded others were thickened others were recanalized and some appeared to be small aneurysms surrounded by inflammatory changes. One pelvic artery was completely filled with thrombus. The other genitourinary organs were not remarkable except for the type of vascular changes already described.

The gastrointestinal tract contained numerous ulcers and small focal infarcts. The submucosal arteries and mesenteric arteries were segmentally thickened nodular and surrounded by perivascular infiltrate which varied from acute to chronic granulomatous inflammation. Arteries showed both partial and complete occlusion with and without thrombosis. An ulcer in the ileum had been surgically closed. The appendix was normal. The peritoneum was covered with a fibrinopurulent exudate. The lymph nodes revealed a reactive adenitis.

This is an acute or subacute inflammatory disease the cause of which is unknown. The supposed relationship to syphilis is no longer accepted. Virus and bacteria have both been implicated, but in the past few years investigations and observations chiefly by Rich (8), suggest that it is the result of an allergic vascular reaction. *Periarteritis nodosa*, also called *polyarteritis* and *panarteritis* affects arteries of the medium size anywhere in the body including the coronaries which are estimated to be involved in as high as 70 percent of the cases. It is impossible to predict which vessels will show the lesions. The most characteristic pathologic change in *periarteritis nodosa* is the focal necrotizing inflammatory lesion with normal intervening segments of vessel wall. Arkin (9) has shown that the various organs of the body are affected as follows: kidneys 80 percent, heart 70 percent, liver 65 percent, gastrointestinal tract 50 percent, pancreas 25 percent, mesenteric artery 30 percent, muscles 30 percent, peripheral nerves 20 percent and central nervous system 8 percent. The best description of the lesions observed is that of Ophuls (10).

(8) Rich, A. R., and Gregory, J. E. Experimental demonstration that *periarteritis nodosa* is manifestly of hypersensitivity. Bull. Johns Hopkins Hosp. 72: 63-68, Feb. 1943.

(9) Arkin, A.. Clinical and pathologic study of *periarteritis nodosa*, report of five cases, histologically healed. Am. J. Path. 6: 401-426, July 1930.

(10) Ophuls, W.; *Periarteritis nodosa*. Tr. Sect. Path. & Physiol. A. M. A. pp. 206-236, 1923, also in Arch. Int. Med. 32: 870-898, Dec. 1923.



The pathogenesis and the findings in the case presented are most adequately explained by such a process. To establish a diagnosis of periarteritis nodosa it is necessary to make use of all the signs and symptoms. Since peripheral neuritis is present in 50 percent of the cases it is an important clue.

The anatomic diagnoses in this case were (1) periarteritis nodosa; (2) thrombosis arterial of small intestine, spleen, and kidneys secondary to periarteritis nodosa; (3) enteritis ulcerative with perforation and surgical repair secondary to periarteritis nodosa, and (4) peritonitis suppurative generalized secondary to ulcerative enteritis.

# Concealed Delayed Hemorrhage

James T. Helsper *Lieutenant, junior grade MC, U. S. N. R.* (1)

Alfred O. Heldobler *Major MC, A. U. S.* (1)

Robert C. Anderson, *Lieutenant Colonel, MC, U. S. A.* (1)

**R**ECENT spotlighting of war wounds and their care has brought to our attention some of the difficulties in their management. One interesting and for a time puzzling complication was concealed delayed hemorrhage. We have recently observed 3 patients with major hemorrhage in the leg which began as long as 4 months after the initial penetrating wound. Bleeding occurred beneath the deep fascia in the area of the interosseous membrane of the tibia and fibula in all three. The hemorrhage was enclosed within a fascial plane which did not communicate with the subcutaneous space or the outside. The most noticeable common factor in these patients in addition to the symmetrical swelling, was excruciating pain which began soon after the hemorrhage started and was extremely resistant to all forms of narcotics. Patients described this pain as a feeling that the leg would burst and in this paper we have called it a distensile pain.

## CASE REPORTS

*Case 1*—A 25-year-old man was wounded on 27 July by a sniper bullet which entered the posterolateral aspect of his right leg just below the popliteal space and came out below the internal malleolus posteriorly. At the time the patient noted profuse bleeding from the lower wound and it became necessary for him to apply a tourniquet. Debridement of the wounds of entrance and exit was done within a few hours. A plaster cast was applied and the patient was returned to the Zone of the Interior. Roentgenograms showed a markedly comminuted fracture of the tibia. About 4 months after the injury long after the wound had healed while the leg was still in a cast the patient suddenly developed a severe distensile aching pain in the midportion of his leg. Nothing unusual was found on physical or roentgenographic examination and it was believed that the patient

(1) Madigan Army Hospital, Tacoma, Wash.

might have an early osteomyelitis. Antibiotics were given and he improved somewhat but about 2 weeks later similar but more severe pain occurred accompanied, this time by marked swelling of his leg. The leg was explored by means of an anterior incision through the deep fascia which exposed about 1 000 cc of clotted blood extending both anteriorly and posteriorly to the almost obliterated interosseous membrane. Following evacuation of the clot, and on release of the tourniquet arterial bleeding occurred just posterior to the tibia at about the junction of its middle and lower thirds. Closer inspection revealed a laceration of the posterior tibial artery about 1 cm. long. The artery was divided and doubly ligated. The wound was packed with aseptic gauze and closed 10 days later. There was no loss of the dorsalis pedis pulse following operation and no apparent reduction in circulation in the leg below the ligation.

**Case 2.**—A 20-year old soldier was wounded on 23 September when a sniper bullet entered the medial side of his leg about 15 cm below the knee and came out at the same level posterolaterally. At that time the patient noted only oozing from his wound. He was forced to crawl about 300 yards before initial aid could be obtained. Dressings were applied and he was sent back through evacuation channels to a hospital where a debridement was performed. A plaster cast was then applied and he was sent to the Zone of the Interior. Roentgenograms revealed a comminuted fracture of the midportion of the fibula with a small piece of metal near the fracture site. About 4 weeks following the injury after the skin had completely healed the patient began to note severe pain and swelling at the site of the injury. Suspecting an abscess an attempt was made to drain it but only a small amount of serous fluid was obtained. Moderate pain and swelling persisted and about 2 months after the initial injury the patient noted an increase of distensible pain and the swelling. The leg was explored and about 2 liters of clotted blood were found in the area between the tibia and fibula. These bones were spread apart and the interosseous membrane was obliterated. After evacuation of the clot and release of the tourniquet, a laceration 1 cm. long in the anterior tibial artery was found near the junction of the middle and upper thirds of the fibula. On applying pressure to the artery with the finger a sharp piece of metal was encountered. It was removed and the artery was divided and doubly ligated. The wound was closed using 2 Penrose drains which were removed 2 days later. There was some diminution of the dorsalis pedis pulse following the ligation but the circulation of the leg has been maintained.

**Case 3.**—A 30-year-old soldier was wounded on 6 December when a sniper bullet entered his right leg about 15 cm. above the medial malleolus and came out at the same level anterolaterally. There was very little bleeding at that time. The patient was able to walk painfully for about a mile. The wounds were debrided in an operating room, a cast

was applied to the extremity and he was sent back to the Zone of the Interior. Roentgenograms showed a compound comminuted fracture of the middle third of the right fibula. About 2 weeks following the initial injury the patient began to complain of severe pain and swelling in the area of the wounds. He was taken to surgery and about 500 cc of clotted blood was found in the area of the interosseous membrane. On evacuation of the clot and removal of the tourniquet, arterial bleeding was found just posterior to the tibia at the junction of the lower and middle thirds. A sharp bony spicule had previously been palpated in this area. The fragment was removed and the artery was divided and doubly ligated. Following operation there was some diminution of the dorsalis pedis pulse but the circulation of the leg remained adequate.

### DISCUSSION

Makins (2) stated that of the 10 000 patients with arterial injury that he reviewed about 24 percent had secondary hemorrhage within 2 years following injury. Most of these occurred in open wounds. Crile (3) has described the diagnosis and management of this condition but did not say whether a local cause of the delayed arterial laceration similar to the metallic fragment and bone spicule seen in two of our patients was found. Other reviewers (4-7) have stated that the secondary hemorrhage they observed occurred before the skin had healed. The only other report of patients similar to ours was made by Brown (8). In one of his patients the profunda femoris artery and in another the popliteal artery ruptured after the wounds had healed causing hemorrhage confined beneath the deep fascia.

In our patients there was definite healing of the skin and deep fascia and the lacerated arteries were all beneath the deep fascia. In two of these a sharp fragment which could have caused the hemorrhage was palpated in the area of the laceration. The incidence of concealed secondary hemorrhages has probably been increased by early care and the use of antibiotics which have promoted quick healing of the

(2) Makins, Sir G. H.: On Gunshot Injury to the Blood-Vessels; founded on experience gained in France during the Great War, 1914-1918. J. & H. Wright and Sons, Ltd., Bristol, England, 1919.

(3) Crile, G., Jr.: Management of injury of major blood vessels. U. S. Nav. M. Bull. 43: 1076-1080 Dec. 1945.

(4) Herrmann, L. G.: Management of injuries to large blood vessels in wounds of violence. Am. J. Surg. 74: 560-575, Nov. 1947.

(5) Furman, N. E.: Secondary hemorrhage arising from gunshot wound of peripheral blood vessels. Ann. Surg. 122: 631-640 Oct. 1945.

(6) Ross, C. A.; Hess, O. W., and Welch, C. S.: Vascular injuries of extremities in battle casualties. Ann. Surg. 123: 161-179 Feb. 1946.

(7) DeBakey, M. E., and Simons, F. A.: Blood injuries (arteries) in World War II, analysis of 2,471 cases. Ann. Surg. 123: 534-579 Apr. 1946, abstr. Bull. U. S. Army M. Dept. 5: 295-300, Mar. 1946.

(8) Brown, M. S.: Secondary hemorrhage following trauma to major blood vessels, Genl. Cl. Bull. 17: 111-115, Jan. 1946.

wounds. Herrmann (4) and Crile (3) believed that these hemorrhages may result from the formation of a false aneurysm following wound involving an artery and rupture of the aneurysm on mobilization or manipulation of the affected extremity. Herrmann, however, stated that the most frequent cause for secondary hemorrhage in the patients he observed was persistence of local infection which followed the initial wound.

Freeman (5) observed that secondary hemorrhage in 68 percent of his patients was associated with a compound fracture and that 67 percent had a history of massive hemorrhage following the initial injury. He also stated that in at least half of his patients a small initial hemorrhage preceded the massive hemorrhage by a few hours. This so-called "red warning" is an absolute indication for exploration. Another interesting observation which was borne out in our patient was made by Makins (2) who said that laceration caused every case of secondary hemorrhage and that transection was neither the cause because it allowed for retraction of the vessel and clotting of the blood.

TABLE I.—Difference between osteomyelitis and deep concealed hemorrhage

	Osteomyelitis	Deep concealed hemorrhage
Onset	Usually gradual	Usually sudden
Temperature	Spiking	Low grade elevations
Pain	Varying	Distressful
Toxicity	Moderate	Minimal
Swelling	Usually localized on one side of extremity	Usually diffuse and symmetrical
Incision and drainage release	Yes	Nothing at all noted beneath deep fascia, then clotted blood

Although in our three patients the circulation of the leg was maintained DeBakey and Sircone (7) stated that 8.5 percent of the anterior tibial transection which occurred in World War II resulted in gangrene and that transection of the posterior tibial artery had to be followed by one type of amputation in 13.6 percent of those on whom it was performed. In our 3 patients osteomyelitis was considered first as the most likely diagnosis. They were all given antibiotics and the temperature recorded every 4 hours. This diagnosis was abandoned because (1) of the lack of spiking temperature and toxicity and (2) the pain and swelling were somewhat different from that usually seen in osteomyelitis. Table I gives the main points of difference between secondary hemorrhage and osteomyelitis.

### CONCLUSIONS

Modern methods of treatment probably increase the likelihood of the formation of concealed deep hemorrhage following gunshot wounds.

When a tentative diagnosis of osteomyelitis becomes untenable and especially if symmetrical swelling and distensile pain are present early exploration should be carried out with a view to ruling out delayed concealed hemorrhage. Two possible results of delayed exploration are pressure necrosis of the muscles in the area or a break through of the hemorrhage to the outside causing possible exsanguination.

(

# Pregnancy in the Right Side of a Double Uterus

George W Markus *First Lieutenant, U. S. A. F (MC) (1)*

**A**LTHOUGH there have been several reports of pregnancies occurring in anomalous uteri in the past the condition is rare enough that each new case should be reported. Anomalous conditions of the uterus, vagina, or both, can arise from failure of the mechanism of fusion or from failure of the disappearance of the septum anywhere along the juncture of the two original Muellerian ducts in the embryo.

Dionis in 1681 and Savard, in 1702 described anomalies of the type herein reported. The developmental processes involved in these conditions were first described by Mueller in 1830 but the mechanism was not fully understood until Kussmaul's work on this subject was published in 1859. The anomalous nature of these uteri when pregnancy occurs is too frequently discovered only at the time of delivery. For this reason the importance of a thorough prenatal examination cannot be overemphasized.

## CASE REPORT

A well-developed white primipara was first seen at the end of the second trimester of pregnancy. She had no complaint. She had been under the prenatal care of another physician but had not had a pelvic examination. The physical findings were essentially normal except for the external and internal genital organs. Speculum and bimanual examination revealed a well-developed 5 mm.-thick vaginal septum extending the length of the vagina from the double cervixes to the introitus. The hymen was perforated on both sides. The left canal was about 1 cm. smaller in diameter than that on the right, which easily admitted two fingers (fig. 1). The right cervix was slightly enlarged, soft, and boggy but presented no other unusual features. The left cervix was small and firm.

Abdominal examination revealed an asymmetrical uterus with the pregnancy apparently in the right half and the left half not well-def

(1) Godman Al Force Bn Fort Knox, Ky





Figure 1.—Speculum examination showing vaginal septum.

It rentiated but giving the impression of a smaller mass firmly attached to the body of the gravid portion of the uterus. The patient was unaware of the anomalous condition of her reproductive organs. She had had normal onset of menses at the age of 14 years, a regular 30-day cycle, a flow of moderate amount, and no dysmenorrhea. No differences had been noticed in the periods from month to month. Her husband was unaware of the septum until the time of the pelvic examination.

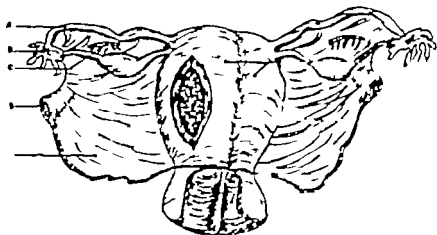


Figure 2.—Diagram of patient's uterus and adnexa seen at time of cesarean section. (A) Salp. ax., (B) fimbria, (C) epiovarum, (D) round ligament, (E) line of incision, (F) broad ligament, (G) double uterus, (H) ovary, (I) lower septum, (J) double cervixes, (K) double vaginal anals, (L) vaginal septum. (Drawing by Capt. P. Quady, U. S. A. F.)

Although the pelvic measurements were within normal limits cesarean section was advised as a means of preventing uterine rupture prolonged first and second stages of labor the probable impossibility of vaginal delivery and the possibility of the infant not surviving an attempted normal birth. At term after an uneventful prenatal course the patient was delivered of a normal 7-pound 10-ounce infant by cesarean section. The placenta was normal and the postpartum course was uneventful. At operation the uterus was double with a midline longitudinal depression showing the position of the intra-uterine septum and with a fairly distinct separation at the fundus. There was one tube and one ovary attached to each half of the uterus (fig. 2). No other anomalies were found in the abdomen or pelvis.

The patient had a second pregnancy delivered by cesarean section, in another part of the country about 1 year later. At that time a tubal ligation was performed.



# Amebiasis<sup>(1)</sup>

## Evaluation of New Therapies

Ryle A. Radke *Colon I MC, U S. A.* (2)

Since 1946 I have been concerned with the evaluation of quinacrine in the treatment of amebiasis. As a result of in vitro and in vivo studies conducted at this hospital the conclusion was reached that quinacrine was a useful therapeutic agent in the management of amebiasis. In connection with this work it became evident that some additional agent should be combined with the quinacrine and carbarsone was selected as being the most promising from the standpoint of eliminating the cystic stage of the causative organism in cultures. A number of patients have been treated with this combination of drugs (3, 4). When Conan (5) described the effect of chloroquine on the hepatic lesions of amebiasis and reported its relative ineffectiveness on the lesions in the bowel my impression was that he had observed a phenomenon similar to the one which we observed with quinacrine namely that an additional agent capable of killing the cystic stage of the organism should be added. I have therefore treated a number of patients with chloroquine combined with carbarsone. Similarly a number of patients have been treated with aureomycin after the technic described by McVay et al (6). A group of patients has been treated with a combination of quinacrine, carbarsone and aureomycin. This last group was treated in this manner because of my conviction that the work of Hargreaves (7) with penicillin and sulfonamides could be confirmed with the substitution of aureomycin.

*Materials and methods*—*Endamoeba histolytica* was demonstrated in material aspirated from rectosigmoidal lesions or in material aspir-

(1) Read before the American Society of Tropical Medicine, Savannah, Ga., November 1950.

(2) U. S. Army Hospital, Fort Knox, Ky.

(3) Radke, R. A.: Treatment of amebiasis with atabrine and carbarsone. (To be published.)

(4) Richardson, O. M.: Treatment of amebiasis with atabrine and carbarsone. Read before Muldraugh Hill Medical Society, Fort Knox, Ky., Aug. 1950.

(5) Conan, N. J. Jr.: Chloroquine in amebiasis. *Am. J. Trop. Med.* 28: 107-110, Jan. 1948.

(6) McVay, L. V., Laird, R. L., and Sprunt, D. H.: Treatment of amebiasis with aureomycin. *South. M. J.* 43: 308-313, Apr. 1950.

(7) Hargreaves, W. H.: Treatment of amebiasis with special reference to chronic amoebic dysentery. *Quart. J. Med.* 15: 123, Jan. 1946.

rated from the fecal stream in the absence of visible lesion. In all patients in this series. All of them had a sigmoidoscopic examination immediately following treatment and again in from 30 to 90 days. At least 3 smears and a culture were taken before the bowel was presumed to be negative. Failure of the visible lesions to heal during treatment has been considered to indicate treatment failure in spite of negative smears and cultures. The dosage of quinacrine used was 0.1 gram 4 times daily for 15 days of carbarsone 0.25 gram 3 times daily for 10 days of chloroquine 0.25 gram 4 times daily for 15 days of aureomycin, when used alone 0.5 gram 4 times daily for 7 days and of aureomycin used in combination with quinacrine and carbarsone 0.25 gram twice daily for 5 days. When women and children were treated the dosage was proportionately less.

Thirty-five patients with melioidosis were treated with quinacrine and carbarsone 38 with chloroquine and carbarsone 33 with aureomycin alone and 33 with an aureomycin-quinacrine and carbarsone combination. Five patients included in the quinacrine-carbarsone group 3 in the chloroquine-carbarsone group 1 in the aureomycin group and all of those in the aureomycin-quinacrine-carbarsone group had previously been treated unsuccessfully by other means.

TABLE I.—Comparative treatment failure rate

Group	Treatment	Percent failure
1	Quinacrine and carbarsone	11
2	Chloroquine and carbarsone	78
3	Aureomycin	65
4	Aureomycin, quinacrine and carbarsone	12

*Results and discussion.*—The quinacrine-carbarsone group usually became symptomatic-free within the first 5 days of treatment. The complications were yellow discoloration of the skin in all patients, occasional use and vomiting which disappeared on discontinuing therapy and lethargy and which did not reappear when medication was again started. The failure rate was 11 percent (table I).

The chloroquine-carbarsone group showed symptomatic improvement when it occurred as far as the bowel symptoms were concerned within from 5 to 10 days. The complications were a peculiar pattern of pupillary accommodation. Almost every patient. This consisted in an inability to focus but an inability to hold the focus longer than a few seconds. In addition most of the patients treated with the 4 drugs had severe nausea and vomiting. This persisted long as treatment was continued. In two patients the symptoms were so severe as to necessitate discontinuing the treatment. The failure rate was 8 percent.

The aureomycin-treated group showed symptomatic improvement of bowel symptoms when it occurred within 2 days. The complications were nausea vomiting and diarrhea in about half of the patients. These persisted as long as the drug was continued. One patient developed a rash which did not reappear when treatment with aureomycin was reinstituted after a rest period. The failure rate was 65 percent.

The aureomycin-quinacrine-carbarsone treated group usually showed improvement of bowel symptoms within the first 2 days of treatment. The complications were a drug rash in 1 patient and as in the quinacrine-carbarsone group a few patients complained of nausea and vomiting which disappeared when the drugs were discontinued and did not reappear when they were again administered in the same dosage. The failure rate was 12 percent.

The comparative failure rates suggest that amebiasis can be managed by a combination of quinacrine and carbarsone with the addition of aureomycin in severe cases and treatment-failures. I have data which suggests that quinacrine and carbarsone are amebicidal in vitro. Shaffer (8) found that vigorous 24-hour cultures of *E. histolytica* are inhibited by the addition of aureomycin to the culture in Shaffer-Frye medium which as he points out suggests that aureomycin is amebicidal. He has also demonstrated an inhibitory effect of quinacrine on the growth of *E. histolytica* in concentrations of 58.8 micrograms per ml (9). The effect on the treatment success of adding aureomycin to quinacrine and carbarsone may be caused by a directly amebicidal action as suggested by Shaffer's data or may be a result of the effect of the drug on the bacteria of the bowel. The rapidity with which patients treated with this combination secure symptomatic relief suggests that some effect on the bacterial content occurs. One patient with hepatic abscess has been treated with quinacrine and carbarsone and 2 others one with pleuropulmonary involvement (10) have been treated with a quinacrine-aureomycin-carbarsone combination, all of them successfully and without surgical intervention except for paracentesis in the pleuropulmonary case. These three patients are not included in the groups mentioned above because of the fact that the treatment was continued for a longer period than that employed in the less severe cases.

The usual patient with amebiasis whom we have treated can be managed either with quinacrine and carbarsone or with a quinacrine-

(8) Shaffer, J. G. In vitro effect of aureomycin on cultures of *Endamoeba histolytica* and *Trichomonas hominis* II. Disappearance of organisms from cultures treated with the antibiotic. (To be published.)

(9) Shaffer, J. G. Personal communication.

(10) Radke, R. A. Amebiasis with hepatic abscess and pleuropulmonary involvement. Armed Forces M. J. 2: 437-444, Mar 1951.

aureomycin-carbarsone combination on an outpatient status. I have made it a rule to hospitalize those with hepatic involvement accompanied by fever, those whom I suspect will not take the drug unless supervised, and those with severe reactions to treatment. A blood count and urinalysis is made on each patient treated with carbarsone prior to starting treatment and the patient is instructed to report at once any untoward symptoms noted while taking the drug.

# Craniotomies in Korea

Gale Clark, *Lieutenant Commander MC U S N (1)*

THE purpose of this report is to enumerate the major problems encountered in primary craniotomies performed on this hospital ship from September 1950 to May 1951. The situation was unique in that a modern well-equipped hospital was immediately available to freshly wounded men, and this was especially true of the operations at Inchon Wonsan and Hungnam. The operative mortality rate of only 14.2 percent was achieved because of the early availability of complete and up-to-date equipment which was ready for use as soon as the hospital ship arrived at the scene of action. Thus 119 craniotomies and 14 craniectomies were performed on soldiers of many nations (table 1).

TABLE 1 — *Nationality of 123 patients undergoing cranial operations*

<i>Nationality</i>	<i>Number</i>
Chinese .....	2
English .....	3
French .....	2
Dutch .....	1
Korean .....	10
Filipino .....	1
Puerto Rican .....	1
Turkish .....	2
United States .....	101
Army .....	(67)
Marine Corps .....	(31)
Navy .....	(3)

## CRANIOPARANASAL SINUS WOUNDS

The operative management of these patients consisted of sinusotomy and craniotomy. The sinusotomy consisted of (1) removal of foreign material and fragments of the sinus wall (2) curetting out all the mucosa of the involved sinus or sinuses (3) plugging the sinonasal duct with bone wax to prevent postoperative pneumoencephalocele and (4) packing the sinus cavity with traumatized muscle and covering it with fibrin foam soaked in penicillin solution. The craniotomy was

(1) U. S. Consul General.



performed to debride, cleanse and achieve hemostasis in the brain and then to restore the watertight integrity of the dura.

The ward management consisted of giving 100 000 units of crystalline penicillin intramuscularly every 3 hours; 0.5 gram of streptomycin intramuscularly every 6 hours for 4 days; and 10 cc (10 000 units) of a penicillin solution intrathecally every day. Early it was believed that giving large doses of urea by mouth might wet down enough molecules of penicillin to carry the penicillin through the choroid plexus to combat the bacteria in the spinal fluid. This was soon found to be ineffective and was discontinued. Hydration, blood and urine studies were made as indicated.

There were 21 patients with paranasal sinus involvement; 13 survived and made uneventful recoveries. They will not be discussed. Eight died but in only one of these was death caused solely by infection. He had a severe basilar meningitis in spite of the fact that he was getting penicillin and streptomycin intramuscularly and penicillin intrathecally. He was the only patient of this group who did not get sulfadiazine either intravenously or by mouth. Five of those who died also had transventricular wounds with bits of contaminated sinus wall blown into one or both lateral ventricles. The seventh patient suffered a concomitant severance of the Galen's vein and the eighth had two tears in the anterior third of his sagittal sinus.

### TRANSVENTRICULAR WOUNDS

Operative management consisted of debridement and cleansing of the ventricle and missile tract, establishing hemostasis and the instillation of about 10 cc. of dilute penicillin solution into the ventricle followed by a tight closure of the dura. Ward management consisted of the same vigorous antibiotic approach as previously outlined for cranio-paranasal sinus wounds.

There were 18 patients with transventricular wounds. Six made uneventful recoveries and will not be discussed. There were 6 patients in whom paranasal sinus material was blown into or through one or more ventricles. All of these 6 died in spite of satisfactory debridement, ventricular instillation of dilute penicillin solution, and strenuous systemic intrathecal and intravenous antibiotic treatment. This was the most distressing group. Four of these patients died of uncontrollable ventriculitis and meningitis. The lack of control of the infection would seem to indicate that a daily intraventricular instillation of antibiotic through polyethylene tubing might be tried in order to provide maximal bacteriostatic effect. The cause of death in 2 of the 6 who died was disruption of vital neurologic centers.

Of the remaining 6 patients, 2 more died as a result of infection while the other 4 died subsequent to destruction of vital centers. One of these died before he could be operated on and at autopsy showed destructive lesions through the right frontal lobe and in both corpora

striata. Another died 3 weeks after operation in a "tear" area from meningitis. The missile had traveled through the frontal lobes from left to right, crossing both ventricles into the right temporal lobe. One Korean patient died 2 days after operation and had a metallic fragment in the mouth of the aqueduct of Sylvius. He had an unsuspected perforated gastric ulcer with peritonitis possibly resulting from his hypothalamic injury. One patient died 71 days after operation of an uncontrolled cerebritis and general deterioration subsequent to an almost complete hemispherectomy of the nondominant side. He had been fitted with a lucite calvarium and was treated with penicillin instillations daily through vitallium screw holes in the hard clear plastic cap. Another patient died 3 days after operation and at autopsy showed destruction of both corpora striata plus a blood cast of his fourth ventricle. The eighteenth patient died 5 days after operation and had suffered a wound from a missile whose course was through the whole right ventricle from the anterior to the occipital horn. At operation this wound was intermittently irrigated through the wound of entrance in the forehead and the wound of exit in the occiput in an effort to flush the ventricle clean. Following this 10 cc of penicillin solution was instilled. In spite of this the patient died of ventriculitis.

#### MAJOR VENOUS SINUS INJURIES

A major venous sinus was involved in 11 patients. Operative management consisted of debridement of the adjacent brain wound and covering of the venous sinus defect by sewing either macerated muscle or fibrin foam over the sinus tear. Five of these patients made uneventful recoveries and will not be described. The sagittal sinus was involved in 8 patients: a lateral sinus in 2, and the Galen's vein was torn and thrombosed in 1. Of those with sagittal sinus involvement 5 died. In 2 of these the sagittal sinus had been cut in two and thrombosed, 1 lived for 14 days and the other for 20 days after the sinus was noted to be completely occluded. One patient also had numerous thrombi in his brain stem which precluded survival even after his sagittal sinus was repaired. Another had massive destruction of the paranasal sinuses bilaterally associated with 2 tears of his sagittal sinus. He died with a severe bronchopneumonia and meningitis. The patient with the thrombosis of the great vein of Galen died 3 days after operation; he also had a transventricular wound from the left frontal lobe to the right occipital lobe with the missile coursing through the anterosuperior portion of the fornix.

#### BRAIN ABSCESS

In treating brain abscess the best response was from removal of the abscess area en bloc and then cauterizing the dura to the cortex and leaving the dura open. Into this cavity polyethylene tubing was placed and used for daily irrigation with a dilute penicillin solution for from 5 to 8 days. This was done in 8 of 10 patients with good results. Immediate closure of the dura over the resected area precluded any direct

treatment to the abscess area and was regrettable in 2 patients who developed severe meningitis 2 and 3 days after operation, respectively.

Because of erroneous concept entertained early, secondary craniotomies were performed to remove small bits of bone missed at the primary operation. These were thought to be abscessed but no bacteria could be grown from the bone fragments or surrounding necrotic material and it is believed that these might better be called zones of liquefaction necrosis. The material in these lesions was dark brown or magenta in color but was evidently rendered bacteria-free with the help of the systemic and local antibiotic medication.

### DURAL TRANSPLANTS

Dural transplants were required in 47 patients (40 percent). One of the major difficulties in these patients was the fact that the transplant was necessarily directly under the scalp incision. In most patients the direction of the scalp incision was predicated by the tear in the scalp made by the missile or missiles. The major objective in closing these wounds was to débride and to extend the scalp wounds adequately so that a maximum blood supply to the flap would remain and allow for subsequent prompt healing. Consequently the dural transplant would be under an edematous scalp sometimes closed under tension. Another distressing situation arose when large areas of scalp, skull, and dura were completely avulsed. In these patients autogenous fascial grafts always failed because of their rapid dehydration and the innominate polyethylene film (although usually difficult to place accurately under the dura) was the material of choice. In most patients however fascial grafts from an uninvolved area of the head were satisfactory.

# X-ray Cones from Shell Casings

Wilson R. Scott, *Captain MC, U. S. A. (1)*

Every radiologist or x-ray technician has at one time or another needed a special type of radiographic cone with which to accomplish a desired result. It is possible that a standard type of cone for his machine could not readily be obtained, because of location or supply. It is for these radiologists and technicians that this article has been prepared in an effort to demonstrate a simple method of overcoming this obstacle. Military roentgenology is accomplished in remote corners of the world, as well as in the United States. The rapidly expanding facilities of the military forces cannot always keep up with the supply of specialized equipment. In these radiographic or therapy departments this method will be of the greatest aid in getting better results until a commercial cone is available. Excellent cones can be made of shell casings and metal scrap obtainable from almost any ordnance unit. The items are available in almost any size required. Table 1 gives the measurements of the standard shell casings used.

After the selection of a shell casing which meets the required measurements the base of the casing is removed leaving a metal tube of desired length. If a machine shop is available the base is easily removed on a lathe otherwise an excellent job can be done with a simple hack saw. The end is then squared. A base of the dimensions required to fit the x-ray tube head is prepared from available scrap preferably  $3/32$  inch thick. A circular hole is then made in this piece of metal to accommodate the end of the casing. If brass has been selected for the base plate the base and casing may be brazed or soldered. If welding facilities are available so much the better. Except for painting or polishing, the completed cone is now ready to go into service (Fig. 1).

Diagnostic departments will find the larger size shell casings to be of greater use. These sizes can be used for examinations of gall bladders, skulls, mastoid processes, sinuses, and other special projections. Therapy departments will find an almost unlimited variety of

(1) U. S. Army Hospital, Camp Pickett, Va.

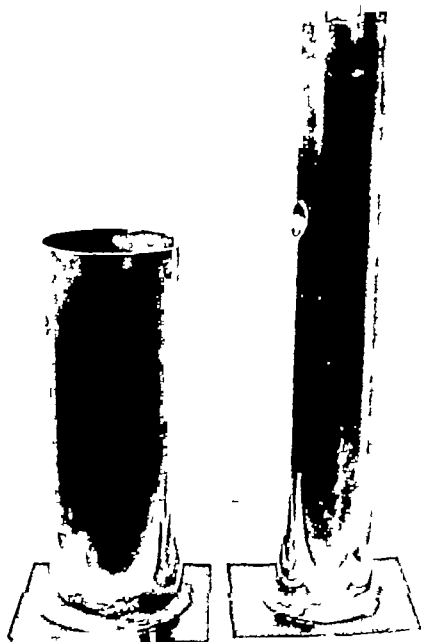
*Figure 1.*

TABLE 1.—*Standard shell-casing sizes.*

Ammunition (millimeter)	Approximate out- side diameter (inch s)	Approximate length (inches)	Cartridge case	Adaptability for con
20	1 1/8	4.34	M 21 A 1	Therapy
37	1 9/16	5.69 8.75	MK 3 A 2 & MK 1 A 2 M 17 & M 16	Therapy
40	1 11/16	12.24	M 25	Therapy
57	2 5/16	17.4	M 23 A 2	Therapy or radiography
75	3 3/16	13.8	M 18	Radiography
76	3 3/16	21.0	M 26	Radiography
90	3 11/16	23.7	M 19	Radiography
105	4 5/16	14.6	M 14	Radiography
120	6 5/16	32.8	M 24	Radiography

casings which can be used for treatment of lesions of varying size. I have used equipment of this type for many months and have found that there is little or no difference in the results obtained with it and those obtained with standard cones.



# Portable Field and Aircraft Inhalator

Russell G. Witwer *Commander MC, U S N (1)*

Joseph E. Ganci *Master Sergeant, U S M. C. (1)*

Harold B. Wright, *Chief Hospital Corpsman, U S N (1)*

THERE has long been a need for a simple easily constructed and inexpensive oxygen-carbon dioxide inhalator among the Marine Air Groups. In view of the ever-changing requirements for breathing apparatus used in high-altitude flying much surplus and obsolete equipment is available for the construction of such an inhalator.

The 9 by 14 by 24 inch box shown in figure 1A is made of half hard aluminum and is light in weight. The total weight is 45 pounds as compared to the 57½-pound weight of the standard (H&H) inhalator. Its small size gives it an added advantage for storage aboard a plane ship or on maneuvers. This box is divided into two compartments (fig. 1B). One contains a platform on which the oxygen regulator is placed. The portable oxygen bottle fits snugly beneath this platform. The remainder of this compartment contains 4 masks for use with the main cylinder and 1 mask for the portable oxygen bottle. The larger compartment contains the 600-liter standard aviator's oxygen cylinder with connections for 4 masks. A small tool kit is located on the regulator platform. Two brackets with wing nuts and bolts hold the large container in position, and may be quickly and easily removed.

The red knob on the regulator has been so marked as to indicate a flow of 10 liters per minute if pressure breathing is desired and the amount of remaining oxygen is constantly indicated on the oxygen cylinder pressure dial. Masks are easily attached with oxygen automatic assembly couplings (AN-6009-2) as shown in figure 2. The inhalator may be used on from 1 to 4 patients simultaneously (fig. 3). The bail-out bottle serves a dual purpose. In the event of oxygen exhaustion from the large cylinder it may be used as a supplemental source of oxygen while the cylinder is being replaced. The change-over can easily be made in 2 minutes and the portable oxygen bottle contains a minimum of 5 minutes supply. The bail-out bottle may also be used in an emergency as a fifth inhalator.

(1) U. S. Marine Corps Air Station, Cherry Point, N. C.



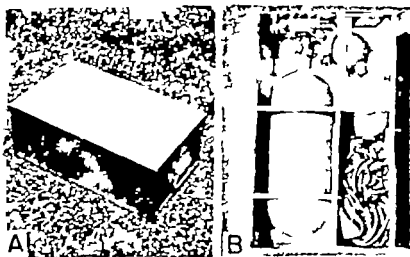


Figure 1.—(A) Inhalator can closed. (B) Inhalator can open.

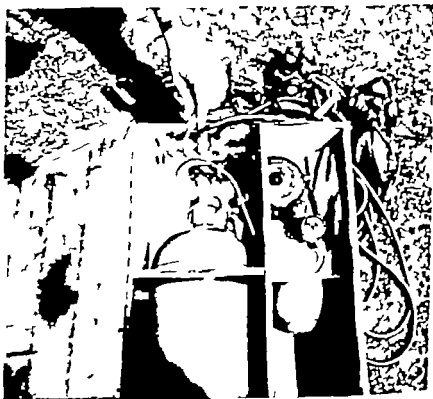


Figure 2.—Inhalator showing oxygen automatic assembly couplings.

The old type dilutor-demand oxygen regulator (AN-6004-1) used with this apparatus is very satisfactory. The masks used are the old style free-flow Army oxygen masks. The portable oxygen cylinder is the old type Army cylinder with an A14 dilutor-demand mask. These parts are seldom if ever used. The standard aviator's oxygen cylinder is readily available. The advantages of this apparatus are the fact



Figure 3 — Four patients using inhalator at one time.

that (1) it is easy to construct and is made from parts readily available at all air stations (2) it is light in weight and small in size requiring a minimum of storage space (3) anyone can be taught its use with a minimum of instruction (4) it is inexpensive practically all parts used being surplus or discarded materials (5) the standard oxygen cylinder contains a much greater supply of oxygen than the conventional type (6) it can be used on four patients simultaneously (7) the oxygen flow can be regulated for either dilutor-demand or positive pressure as required (the amount of remaining oxygen in the cylinder is always known); and (8) the cylinder can be quickly replaced when the oxygen supply becomes exhausted and the portable oxygen bottle affords an uninterrupted supply while the change is being made.

It is believed that this inhalator would be of great value in emergencies aboard ships, transport planes, and especially on a beachhead or in the field.



# Bacitracin and Gelfoam

## Combined Use in Dentistry

Albert D. Alexander *Commander DC, U. S. N. R.*

**T**HE PURPOSE of this article is to invite attention to the value of gelfoam impregnated with bacitracin in the postextraction wound. The particular reference to its efficacy in oral surgery should not minimize its potentialities in other fields such as neurosurgery (1,3), otorhinolaryngology (4) and thoracic surgery (5).

Hemorrhage and infection are the two major complications of dental extractions. The incidence of these complications and the associated discomfort of the patient may be reduced by simple preventive therapy. The rationale includes the use of an absorbable gelatin sponge to control bleeding, to obliterate dead space, and to promote healing by furnishing an aid in clot scaffolding. By combining a locally acting antibiotic with gelfoam, infection can be prevented. Bacitracin was selected because of its wide-range local antibiotic activity, in addition to the fact that no enzyme has been demonstrated *in vivo* which inactivates it.

Gelfoam is a sterile, pliable, nonantigenic surgical sponge capable of absorbing and holding within its meshes many times its weight of whole blood. When implanted in tissues it is completely absorbed in from four to six weeks without inducing excessive scar tissue formation. It is prepared from specially treated and purified gelatin solution which is beaten to the desired porosity, dried, sectioned, packed in jars, sterilized by dry heat, and the jar sealed to assure sterility of contents. (6) The investigations of Correll et al. (7) indicated that

(1) Fischer, E. F.: Further use of gelatin foam in neurosurgery. *J. Neurosurg.* 4: 97-104, Mar. 1947.

(2) Light, R. U. and Prestice, H. P.: Surgical investigation of new absorbable sponge derived from gelatin for use in hemostasis. *J. Neurosurg.* 2: 435-455, Sept. 1945.

(3) Light, R. U.: Hemostasis in neurosurgery. *J. Neurosurg.* 2: 414-434, Sept. 1945.

(4) Cope, B. A. and Hipschard, M. M.: Use of new gels in treatment of epistaxis. *Eye, Ear, Nose & Throat Monthly* 26: 417-419, Aug. 1947.

(5) Velsi, V.; Ross, W. B., and Lubitz, J. M.: Behavior of gelatin film in human tissue and its aid in repair of pleural defects. *Arch. Surg.* 60: 87-91, Jan. 1950.

(6) Berg, L.: Gelfoam in dentistry. *Dental Items of Interest* 3: 69-73, 1947.

(7) Correll, J. T.; Prestice, H. R., and Wise, E. C.: Biologic investigations of new absorbable sponge. *Surg., Gynec. & Obst.* 81: 585-589, Nov. 1945.

gelfoam was superior to fiber foam and starch sponge with respect to absorbability in vivo. In addition, the histologic studies of these investigators revealed minimal foreign-body tissue reaction. Light and Prentice (2) using intracranial implants followed by microscopic studies revealed similar tissue tolerance for gelatin foam in addition to its excellent hemostatic qualities. Guralnick (8) and Berg (6) reported promising clinical observations on the prevention of postextraction hemorrhage. Both men hinted at the possible value of the addition of an antibiotic agent. Fincher (1) suggested the use of penicillin sponges in neurosurgery. Costich (9) used the dry sponge with the addition of thrombin to control hemorrhage. He reported no retardation of healing in 100 patients. Guralnick and Berg (10) in a study of 250 patients concluded that gelfoam represented a real advance in oral surgery.

Thrombin or penicillin showed no loss of potency from solutions in which absorbable gelatin sponges were suspended. (11) Silverman (12) compared results in 105 patients with 105 relative clinical controls using gelatin sponge in a thrombin-penicillin solution. He noted a significant reduction in degree and incidence of postoperative pain and recommended widespread clinical trial.

Bacitracin is a product of the growth of the Tracy I<sup>st</sup> strain of *Bacillus subtilis*. It was first reported by Johnson, Anker, and Meloney (13). After considerable laboratory investigation, Meloney and Johnston (14) issued the first clinical report based on local use in surgical infections. Bond et al. (15) in their studies on the stability of bacitracin found the dry powder quite stable over long periods at temperatures as high as 37° C. and the aqueous solutions adjusted to a pH of from 5 to 7 with or without buffers stable for several months at refrigerator temperatures. Thus the solutions of bacitracin in concentrations sufficient for its topical efficacy can be made up and stored for ready use. The placing of gelfoam into the antibiotic solutions apparently does not alter the antibiotic efficiency of the latter or impair the hemostatic qualities of the former.

(8) Guralnick, W. C. Absorbable gelatin sponge and thrombin in oral surgery. *Am. J. Orthodontics* (Oral Surg. Sect.) 52: 792-794, Dec. 1946.

(9) Costich, E. R. Clinical use of gelatin sponge in dental surgery. *New York State Dental Journal* 13: 570-573, 1947.

(10) Guralnick, W. C. and Berg, L. Gelfoam in oral surgery: report of 250 cases. *Oral Surg., Oral Med. & Oral Path.* 1: 632-639, July 1948.

(11) Carrell, J. T. and Wise, E. C. Stability of thrombin, penicillin, or streptomycin in presence of gelatin sponge, oxidized cellulose or each other. *Surg., Gynec. & Obst.* 85: 211-213, Aug. 1947.

(12) Silverman, L. M. Investigation of gelatin sponges with thrombin and penicillin in the treatment of oral surgical wounds. *Oral Surg., Oral Med. & Oral Path.* 2: 260-265, Feb. 1949.

(13) Johnson, B. A., Anker, H., and Meloney, F. L. Bacitracin, new antibiotic produced by the bacterium *B. subtilis* group. *Science* 102: 576-577, Oct. 12, 1945.

(14) Meloney, F. L. and Johnston, B. Bacitracin therapy: first 100 cases of surgical infections treated locally with antibiotic. *J. A. M. A.* 133: 675-680, Mar. 8, 1947.

(15) Bond, G. C., Himmelfrick, R. E., and McDonald, L. R. Stability of bacitracin. *J. Am. Pharm. Ass. Scientific edition* 38: 30-34, 1949.

The chief limitation of penicillin is its destruction by penicillinase. Bacitracin does not appear to be affected by the organisms that produce penicillinase. There have been no reports of local irritation or general toxicity by investigators. Resistance is slow to build up against bacitracin. Many organisms that are resistant to penicillin are susceptible to bacitracin. Its antibacterial spectrum is wide. Bacitracin is more effective against nonhemolytic streptococci than penicillin (16). More over it is active against many penicillin-resistant strains of staphylococci. It is not inactivated by the gram-negative rods that destroy penicillin. Its elimination from the body is slower. In mixed infections therefore bacitracin may be more effective than penicillin. In vitro studies have shown bacitracin to be effective against hemolytic streptococci *Streptococcus viridans* enterococci and all strains of pneumococci.

Clinical trials were carried out using the antibiotic in sterile distilled water and in saline solution with procaine. It was found that the procaine solutions did not cause any apparent change in the properties of either gelfoam or bacitracin. For convenience the procaine solution which comes in 2 cc cartridge ampules was decided on in making up the bacitracin solution. Bacitracin may be obtained in 20 cc vials supplying 2 000 10 000 and 50 000 units. The 10 000-unit vial was found to be the most convenient. By adding 10 cc of a 1 2 or 4 percent solution of procaine to 10 000 units of bacitracin, a solution containing 1 000 units per cc was obtained. This was found to be sufficient for the control of dental postextraction infection.

Preparation consists of adding bacitracin solution to cut pieces of gelfoam in the following manner. Gelfoam sticks are cut with scissors to the desired size of sponge required one stick making about 10 sponges. The bacitracin solution is prepared by adding five 2-cc cartridge ampoules of procaine solution to the vial of 10 000 units of dry powder. The vial will hold 20 cc and will allow plenty of space for the agitation and solution of the powder which is readily soluble. The bacitracin solution is then placed into the gelfoam jar containing the cut pieces of sponge saturating the sponges. The jar is kept in the refrigerator ready for use.

Clinical observations of over 1 000 patients has proved highly satisfactory. The clinical appearance of the postoperative wound together with the appreciation expressed by the patients is most gratifying. The simplicity and convenience of use in this form is striking. The operator simply lifts out one or more sponges and places them into the alveolar socket or defect. Sponges will remain in most sockets without mechanical aids. The gingiva may be sutured if desired. A sterile gauze pad is placed over the wound and biting pressure is applied by the patient. Larger defects resulting from cystectomies tumor

(16) Meloney F., Treatment of surgical infections with antibiotic. B. H. U. S. Army Med. Dept. 8: 445-451. June 1948.

enucleations et cetera should be packed completely before closure. The antibiotic activity of bacitracin will permit tight suture.

#### SUMMARY

*Gelfoam 15 of 1d* is the control of postextraction hemorrhage and is valuable in obliterating dead space. Because it is completely absorbed minimal scarring is produced. *Gelfoam* further aids healing by furnishing a clot matrix.

Bacitracin is an effective locally acting antibiotic agent particularly adaptable to oral use. The combination of *Gelfoam* and bacitracin results in a product which embodies the desired qualities of both.

In the treatment of already established infections bacteriologic evaluations are needed to identify the causative organism and thus indicate the proper antibiotic or other therapeutic treatment. No antibiotic is a substitute for good surgical technique.

# Tularemia

Norris A. Wimberley Jr. Major ASC, U. S. A.

**A**UREOMYCIN is the drug of choice in the treatment of acute tularemia. The optimal dosage is as yet unknown Dagradi et al. (1) Taylor (2) and others have had almost uniformly good results in patients treated relatively late in the course of the disease. The following case report demonstrates the results of insufficient dosage of aureomycin, possibly used because treatment was instituted almost immediately at the onset of the disease.

## CASE REPORT

A 33-year-old man was seen complaining of the sudden onset on the preceding evening of fatigue generalized muscular aching severe mental depression, a severe chill a temperature of 104° F and a severe bitemporal headache which was described as "expanding in character. The history revealed that he had cleaned 22 rabbits 5 days prior to the onset and he and his family had eaten some of them. No other members of the family were ill.

Physical examination revealed a well developed man who appeared acutely ill. His temperature was 102.2° F his pulse was full and regular with a rate of 104. His cheeks were flushed and there was a mild conjunctival hyperemia (the mental depression was associated with crying). There was bilateral axillary adenopathy more marked on the left the nodes being nontender freely movable discrete and about the size of lima beans. His epitrochlear cervical and inguinal nodes were not palpable. His only skin lesion was a small crusted incised wound over the left ring finger which occurred while he was cleaning one of the rabbits. The white blood cell count was 17,150 with 87 neutrophils (including 7 stab and 2 juvenile forms) and 13 lymphocytes. The hemoglobin was 13 grams. A roentgenogram of the chest was negative. Agglutination tests for tularemia and brucellosis were reported as negative.

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(1) Dagradi, A. E.; Sollod, N., and Friedlander, J. H.: Treatment of tularemia with aureomycin. *New York State J. Med.* 50: 1970, Aug. 15, 1950.

(2) Taylor, R. R. Report on tularemia its diagnosis and treatment. *J. Arkansas M. Soc.* 47: 47-50 July 1950.



The possibility of acute tularemia could not be excluded and the patient was given an initial dose of 1 gram of aureomycin followed by 0.25 gram every 4 hours. His temperature remained near 102° F through the night despite the liberal use of aspirin in doses of 0.6 gram. The following afternoon it rose to 104.2° F. This was followed by profuse diaphoresis and subsidence of the temperature to 98.8° F. The patient slept comfortably through the night. His temperature remained normal for the next 2 days and all associated symptoms with the exception of moderate fatigue cleared. On the afternoon of the fourth day of illness mild bitemporal headache recurred but was unassociated with other symptoms. On the fifth day the patient was allowed out of bed, experiencing only mild giddiness. The following day all medication was discontinued. He returned to work on the seventh day but experienced a sensation of chilliness and his temperature rose to 102° F. No frank chill occurred. This was again followed by profuse diaphoresis and return of his temperature to normal. He was again given 0.5 gram of aureomycin every 4 hours omitting the 2 a. m. dose. This was continued for 9 days and during this period there was no fever and the patient experienced no symptoms with the exception of malaise for the first few days. No gastrointestinal or other side effects were noted. Aureomycin was again discontinued on the sixteenth day of the illness, the patient having returned to work several days previously. On the eighteenth day his temperature again rose to 102° F and there was a moderate chill. He was given an initial dose of 0.5 gram of aureomycin, and 0.25 gram every 4 hours for 24 hours. No further medication was given. He responded in 24 hours and thereafter remained afebrile with the exception of an evening rise to 100.2° F on the twenty-third day of illness. On the twentieth day it was reported that agglutination for tularemia in blood drawn on the sixteenth day was positive in a dilution of 1:320. Agglutination studies were reported as shown in table I.

TABLE I.—Agglutination tests

Day of illness	Antigen	Result	Dilution
2	Tularemia Brucella	Negative Negative	
16	Tularemia Brucella	Complete Negative	1:320
31	Tularemia Brucella	Complete Complete	1:1280 1:640
41	Tularemia	Complete	1:1280

## DISCUSSION

Further history on this patient revealed that he had been rabbit hunting each week for 5 weeks preceding the onset of illness but that 5 days prior to onset of the illness one rabbit had been caught by the dogs possibly because it was ill. This rabbit was kept separate but was cleaned after some discussion. During cleaning it was noted that there were some spots on the animal's spleen but none on the liver. Because of this the animal was discarded but not before some of the peritoneal fluid had come in contact with the patient's skin which he had previously incised over the left ring finger while cleaning another rabbit. Symptoms and fever were controlled within 24 hours of the institution of therapy and the typical cutaneous lesion did not develop but recurrence of fever and symptoms was not prevented by the dosage schedule employed when discontinued. The drug proved no less effective when reinstituted on two occasions following recurrence of symptoms.

## SUMMARY AND CONCLUSIONS

Treatment with aureomycin was instituted on the second day of illness of a man with tularemia. One gram of aureomycin as an initial dose followed by 0.25 gram every 4 hours for 4 days controlled symptoms within 24 hours and possibly prevented the development of the typical cutaneous lesion but failed to prevent recurrence of symptoms when it was discontinued. No evidence of loss of effect resulting from resistance of the organism was noted on reinstitution of therapy after relapse. Half a gram of aureomycin every 4 hours with omission of the 2 a. m. dose for 9 days proved ineffective in preventing a recurrence of symptoms following discontinuation of medication although the patient had been afebrile for 7 days this dosage was sufficient to control symptoms within 24 hours when reinstituted on the ninth day of illness. Although aureomycin is generally agreed to be the drug of choice the optimal dosage for tularemia has not been established. It is possible that in patients treated early in the course of the disease larger doses or longer periods of therapy will be required.



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- Bacteriological Technique A Guide for Medical Laboratory Technicians**, by *W W W McEwen, A. I. M. L. T. F. R. M. S.* Bacteriologist, Messrs Lantigen (Eng.) Ltd. Late Chief Technician and Lecturer in Bacteriology Nottingham and District Technical College Nottingham with a foreword by Professor *Sir Alexander Fleming, F. R. C. P., F. R. C. S.* F. R. S. 293 pages 70 illustrations. Chemical Publishing Co. Inc., Brooklyn, N Y., publishers, 1950
- Diabetes Mellitus Principles and Treatment**, by *Garfield G. Duncan, M. D.* Clinical Professor of Medicine Jefferson Medical College Director of the Medical Divisions of the Pennsylvania Hospital and the Benjamin Franklin Clinic Philadelphia, with the collaboration of *Ferdinand Fetter M. D.* Assistant Professor of Medicine University of Pennsylvania and Associate Physician to the Pennsylvania Hospital *Perry S. MacNeal M. D.*, Associate in Medicine Jefferson Medical College Physician to the Pennsylvania Hospital and Associate in the Benjamin Franklin Clinic *Barkley Bridleman, M. D.* Assistant in Medicine Jefferson Medical College Research Fellow and Assistant Physician to the Out-patient Department, Pennsylvania Hospital and Associate in the Benjamin Franklin Clinic and *Martba A. Hunsche B. S.*, Director of the Food Clinic Pennsylvania Hospital 289 pages illustrated. W B. Saunders Co Philadelphia Pa., publisher 1951
- Electroencephalography in Clinical Practice** by *Robert S. Schwab M. D.* Director of the Brain Wave Laboratory Massachusetts General Hospital and Associate in Neurology Harvard Medical School 195 pages illustrated. W B. Saunders Co Philadelphia Pa publisher 1951
- Patterns of Disease on a Basis of Physiologic Pathology** by *Frank L. Apperly M. A., M. D. (Oxford), D. Sc. (Melbourne), F. R. C. P. (London)*, Professor of Pathology Medical College of Virginia Richmond, Va 456 pages 50 figures and 37 charts J B Lippincott Co., Philadelphia, Pa. publishers, 1951
- History of Pharmacy A Guide and a Survey** by *Edward Kremers Ph. G. Ph. M. Ph. D. Sc. D.* Late Director Course in Pharmacy and Professor of Pharmaceutical Chemistry University of Wisconsin and *George Urdang, Ph. G. D. Sc. Nat. Sc. D.*, Professor of the History of Pharmacy University of Wisconsin and Director of the American Institute of the History of Pharmacy 2d edition, revised and enlarged. 622 pages 30 illustrations. J B Lippincott Co Philadelphia Pa publishers 1951

**Pharmacognosy** The Study of Natural Drug Substances and Certain Allied Products by *Robertson Pratt*, Ph. D. Associate Professor of Pharmacognosy and Plant Physiology, University of California College of Pharmacy and *Hilber W. Youngken*, J. Ph. D., Associate Professor and Chairman for Pharmacognosy, University of Washington College of Pharmacy. 644 pages. 67 illustrations, including 4 plates in full color. J. B. Lippincott Co., Philadelphia, Pa., publishers. 1951.

**After the A Bomb? Emergency Care in Atomic Warfare** edited by *Charles F. Behrens*, M. D., Commanding Officer, Naval Medical Research Institute, National Naval Medical Center, Director, Atomic Defense Division, Bureau of Medicine and Surgery, Department of the Navy. 182 pages. Thomas Nelson & Son, New York, N. Y., publisher. 1951. Price \$2.50.

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**Clinical Unipolar Electrocardiography** by *Bernard S. Lipman*, A. B., M. D., Assistant in Medicine, Emory University School of Medicine, Atlanta, Ga., and *Edward Nassie*, A. B., M. D., F. A. C. P. Assistant Professor of Clinical Medicine, Washington University School of Medicine, Director of Heart Section, Barnes Hospital, St. Louis. Director, Cardiovascular Clinic, Washington University Clinic. 232 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publisher. 1951. Price \$5.

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**Visceral Radiology**, by *Emerik Kertész*, M. D. Formerly Scientific Collaborator of the Central Radiologic Institute of the General Hospital (Holzhacker-Institute), Vienna. Head of the Radiologic Department of Elizabeth Hospital of the City of Budapest. Post-graduate Lecturer at the Central Radiologic Institute of the University of Budapest. Radiologist of the Seibert Clinic, Atlanta, Ga. 612 pages; illustrated. The Macmillan Co., New York, N. Y., publisher. 1951. Price \$24.

- The Physiology of the Newborn Infant**, by Clement A. Smith, M. D. Associate Professor of Pediatrics, Boston Lying-in Hospital Harvard Medical School 363 pages; 52 illustrations Charles C Thomas Publisher Springfield Ill., 1951 Price \$7.50.
- Scoliosis Pathology Etiology and Treatment**, by Samuel Kleinberg, M. D. Attending Orthopedic Surgeon Hospital for Joint Diseases Consulting Orthopedic Surgeon Lebanon Hospital Maimonides Hospital Hospital for Special Surgery New York City Lecturer in Orthopedics, New York University Medical School Member American Orthopedic Association Member American Academy of Orthopedic Surgery Fellow American College of Surgeons Fellow New York Academy of Medicine Member American Academy of Compensation Medicine 286 pages, illustrated The Williams & Wilkins Co Baltimore Md publisher 1951 Price \$7.50.
- Papals** by M. L. Tainter, C. E. Alford, A. Arnold, H. Blumberg, O. H. Buchan, E. T. Hinkel, J. K. Huang, A. C. Ivy, R. K. Lager, J. R. Schmitz, J. R. Shepherd, H. S. Wykes, and C. Zippin, Editor Roy Waldo Miner Associate Editor B. J. Heneghan, Consulting Editor M. L. Tainter Annals of the New York Academy of Sciences Volume 54 Art. 2 pages 143-296. 296 pages illustrations. Annals of the New York Academy of Sciences, New York, N. Y. publisher 1951 Price \$3.
- Anatomy in Surgery** by Philip Thorek, M. D. F. A. C. S., F. I. C. S., Assistant Clinical Professor of Surgery (Formerly Assigned to Gross and Topographic Anatomy), University of Illinois College of Medicine-Diplomate of the American Board of Surgery Associate Professor of Topographic Anatomy and Clinical Surgery Cook County Graduate School of Medicine Member of the American Association of Anatomists Fellow American College of Chest Physicians Co-surgeon in Chief of the American Hospital Associate Attending Surgeon of the Cook County Hospital Senior Attending Surgeon of the Alexian Brothers' Hospital 970 page 720 illustrations. J. B. Lippincott Co Philadelphia Pa. publisher 1951 Price \$22.50.
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- Manual of Massage and Movements** by Edith M. Prosser T. M. M. G. Trained Nurse and Certified Midwife Member of Council of Chartered Society of Massage and Medical Gymnastics 1936-44 Sister in Charge Massage Department and Principal of School 1930-1949 continuing Examiner for Chartered Society of Physiotherapy at the Middlesex Hospital, London since 1928. 388 pages; illustrated. J. B. Lippincott Co Philadelphia Pa., publisher 1951 Price \$6.
- Diagnostic Standards and Classifications of Tuberculosis** 1950 edition 64 pages National Tuberculosis Association, New York, N. Y. publisher 1950
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**Surgical Pathology of the Mouth**, by E. Wilfred Fink, C. B. E., M. D. Ch. B. L. D. S. (Mouth), D. D. Sc. (Melb.), D. Sc. (Lond.), F. D. S., R. C. S. (Eng.) (From the Meyerst in Laboratory for Dental Research St. Mary Hospital Paddington, London), Dental Surgeon St. Mary Hospital, London, Lat. Dental Surgeon Royal Dental Hospital London Hon. Research Assistant in Physiology University College London Formal Examiner in Oral Anatomy and Physiology University of Durham; Lat. Examiner in Dental Surgery and Pathology University of Manchester 463 pages illustrated. J. B. Lippincott Co. Philadelphia Pa. publisher 1951 Price \$10

**Management of Cellulitis Cases** by Sidney Valentine Haas, M. D. Prof. Emer. of Pediatrics and Director of the Department, New York Polyclinic Medical School and Hospital, Consultant, Lebanon Hospital Harlem Hospital, and Riverside Hospital for Contagious Diseases of the New York Health Department; Fellow of the New York Academy of Medicine and Merrill Peterson Haas M. D. 188 pages 12 illustrations. J. B. Lippincott Co., Philadelphia Pa. publisher 1951 Price \$5

**Therapy of Dermatologic Disorders Including Guide to Diagnosis and Dermatologic Pharmacopoeia** by Samuel M. Peck, B. S. M. D. Dermatologist to the Mount Sinai Hospital, New York City Associate Clinical Professor of Dermatology Columbia University New York City Medical Director (R) Infectious Diseases U. S. P. H. S., and George Klemm, M. D. Associate Visiting Dermatologist, Morrisania City Hospital, New York City Acting Adjunct, Mount Sinai Hospital New York City Assistant Clinical Professor of Dermatology New York Medical College 383 pages. Lea & Febiger Philadelphia, Pa. publishers 1951 Price \$6.50

**Diseases of the Endocrine Glands**, by Louis J. Soffer, M. D., F. A. C. P., Associate Attending Physician and Head of the Endocrine Research Laboratory and Clinic, The Mount Sinai Hospital New York City Assistant Clinical Professor of Medicine Columbia University 1142 pages 88 illustrations and 3 colored plates. Lea & Febiger Philadelphia, Pa. publishers 1951 Price \$15

**Principles of Medical Statistics**, by A. Bradford Hill, D. Sc. Ph. D. Professor of Medical Statistics in the University of London (London School of Hygiene and Tropical Medicine); Honorary Secretary of the Royal Statistical Society Civil Consultant in Medical Statistics to the Royal Air Force; Member of the International Statistical Institute 5th edition revised and enlarged. 282 pages Oxford University Press New York N. Y., publisher 1950. Price \$3

**Modern Dietetics** by Doris Johnson, B. S. M. S. Fellow in Home Economics, University of Wisconsin Formerly Supervisor Ward Dietary Service The Presbyterian Hospital of the City of New York, and Instructor in Dietetics Department of Nursing, College of Physicians and Surgeons, Columbia University 529 pages illustrated. G. P. Putnam Sons New York N. Y. publisher 1951

**Method in Medical Research** General Board. Irvine H. Page, Chairman A. C. Ivy, Colin M. MacLeod, Carl F. Schmidt, Eugene A. Stead, David L. Thomson, Vol. IV. Maurice B. Vacher, Editor-in-Chief. Histological Staining Method, Georg Gamers, Editor. Fluid and Electrolyte Distribution, Louis B. Flexner, Editor. Studies on Gastrointestinal Processes, Inactivation and Secretion, J. P. Quigley, Editor. Tissue Culture Method, C. M. Pomeroy, Editor. 306 pages illustrated. The Year Book Publishers Inc. Chicago, Ill., 1951 Price \$7

## BOOK REVIEWS

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**Progressive Resistance Exercise Technic and Medical Application** by *Thomas L. DeLorme* B. S., M. D. Assistant in Physical Medicine Massachusetts General Hospital, Consultant in Physical Medicine Long Island Hospital Boston, and *Arthur L. Watkins* A. B., M. D. Assistant Clinical Professor of Medicine Harvard Medical School, Chief of Physical Medicine Massachusetts General Hospital Foreword by *Joseph S. Barr* M. D. 245 pages illustrated. Appleton-Century-Crofts Inc. New York, N. Y. publishers 1951 Price \$5

Progressive resistance exercise has been rather generally accepted by physicians and physical therapists as the best method of treatment for muscles weakened by disease or injury. In spite of this fact there are many times when the results from this treatment are disappointing. Usually this is because the technique of applying the principles of progressive resistance exercises is faulty. This book fills a great need in that the text and pictures give the reader detailed instruction in the best way to exercise various muscle groups. DeLorme has spent a great deal of time in devising equipment and technique for scientifically applying the principles of heavy resistance exercise to a variety of clinical conditions. Although the chapter on physiology written by Hellerbrandt is not complete enough for a text of this type. It should stimulate the reader to investigate other aspects of the physiology of exercise.

The techniques described have largely been devised for use on the Elgin exercise table. Many of the exercises can be adapted to improvised equipment but may thereby lose some of their effectiveness. Unfortunately the Elgin equipment is not available to all departments of physical medicine because of its cost. There are however enough illustrations of exercises which can be performed without this highly specialized equipment to make the book worthwhile. This monograph should be read by all physiatrists and physical therapists. The orthopedic surgeon, the neurologist, and the general practitioner could also read it to good advantage. Most of the book is written in plain language easily understood by the physical therapist as well as by the physician. This book is of special interest to those of us in the Armed Service because it is essential that we return men to full duty as soon as possible with a minimum of disability from their disease or injury. There is no quicker method of improving muscle strength than with progressive resistance exercise hence adoption of the principles outlined in this book to convalescent service men will give us a better more efficient fighting force. In regards to the service man in training, it might be well to apply some of the principles of progressive resistance exercise for the purpose of conditioning him for tasks requiring physical stamina. In the light of our newer knowledge we should critically examine our physical training programs to see if we can condition our men more quickly thus allowing more time for other training.

—Maj J. N. Schaeffer U. S. A. F. (MC)



P al Ehrlich by Martha Marquardt. 255 pages; ill. strated. Henry Schuman, Inc., New York, N. Y., publisher, 1950. Price \$3.50.

This slim but the publisher popular L.H. f Scie Library biography f on of th greatest figures i the hi story of modern medicine. The discovery f th arsenical eris f drug ad their pecifi effect in many pirochetal disease of man and animals undoubtedly stimulated chemotherapeutic research, and led logically to th development f th sulfonamides and th antibiotics. Ehrlich i th great pioneer of modern chemotherapy ad alvians, th "magi bullet" to lay yphili was th first many sch guided misall galant disease. His Marquardt wa Dr Ehrlich secretary from 1902 until his death in 1915 and it i natural ad most fortunate that h b given fine portrait f gre t man. Th ill strations are most shapli fature of th book and it i gratify g to ha e them permanently preserved. The Royal Society f London ha commi ioned Mi Marquardt to collect ad edit all of Ehrlich's scientific papers. This should b most important contribution to th history of medicine.

—Capt. L. H. Reddis MC, U. S. N. (Ret.)

Handbook f Medical Management, by Milton Cheson, A. B., M. D., i structure in Medicine, University f California Medical School, San Francisco; Sheldon Margen, A. B., M. D., Clinical Instructor in Medicine, University of California Medical School, San Francisco; Henry D. Brunner, A. B., M. D., Assistant Clinical Professor of Medicine and Pediatric, University f California Medical School, San Francisco; Assistant Clinical Professor f Pediatrics, Stanford University School of Medicine; Physician in Charge, Isolation Division, San Francisco Hospital. 2d edition. 508 pages; ill. strated. University Medical Publishers, Palo Alto, Calif., publishers, 1951. Price \$3.00.

The authors f thi pocket-sized book are to be commended for superior skills f therapy. It represents truly outstanding condensation f significant detail f currently accepted method f treatment in th field of internal medicine. The book has an excellent index for rapid reference and contains many useful tables of reference. Both the metric system and apothecary system of weights and measures are used in the text. The common or proprietary names for medication are included in parentheses wherever this would be useful. Of particular interest i the inclusion in the text of code numbers from th Standard Nomenclature f Disease and Standard Nomenclature f Operation f the American Medical Association with the use f diagnoses. This should be helpful in the coding f records. The chapters on th general aspects f medical management, fluid and electrolyte therapy and parenteral feeding, and general symptomatic treatment are particularly well written. The book should prove of particular value to th busy internist as well as to th busy practitioner. —Lt. Col. W. R. Haas MC, U. S. A.

A Primer for Psychotherapists, by Kenneth Mark Colby, M. D., Adjunct f Psychiatry, Mount Zion Hospital, San Francisco; Clinical Assistant, San Francisco Institute f Psychoanalysis; formerly Lecturer in Psychiatry, Department of Social Welfare, University of California. 167 pages. The Ronald Press Co., New York, N. Y., publisher, 1951. Price \$3.

This primer should be required reading for all psychiatric residents, psychiatrists, and psychiatric social workers. It is a lively read and not encumbered by the too frequent use of confusing or controversial terms. The approach to psychotherapy is psychoanalytically oriented. Subjects discussed with abundant example include the aim and basic theory f psychotherapy, psychologic appraisal of the patient, the task and countertransference of the therapist, and time and space conditions for th interview.

behavior of the patient and the therapist during the interview a technic of beginning the therapy the middle course of therapy (including excellent examples of how and when to make interpretations and how to handle resistances transferences, and the working-through process); ending the therapy and a good, practical nontransmutative technic for psychotherapy of the ambulatory schizophrenic patient. The author is to be congratulated for his ability to present in simple and readable form the elementary principles of psychotherapy for beginners in this professional specialty. Although a bibliography is lacking it is not really needed here as the main purpose is to give the beginner the concrete help he will need in undertaking psychotherapy of neurotic and psychotic patients.—*Col. F. R. Drake MC U S A.*

**Accepted Dental Remedies Including a List of Accepted Products Together With Other Information Compiled to Promote Rational Therapeutics in Dentistry** 16th edition. 207 pages. American Dental Association, Council on Dental Therapeutics, Chicago Ill. publishers 1951. Price \$1.50.

This report has been published annually since 1930 and is an authoritative reference book which lists those commercial products currently accepted by the Council on Dental Therapeutics of the American Dental Association and describes nearly all of the therapeutic items which are useful in dental practice. The listings conform to the standards of the United States Pharmacopoeia and the National Formulary. Grouped into chapters according to their basic pharmacologic action the drugs are discussed as to physical properties, actions and uses, and dosage. When indicated, precautionary measures and incompatibilities are described. Chapter and subchapter introductions provide a general discussion of the drugs. For ready reference there is a separate chapter on the symptoms and treatment of acute poisoning and a chapter offering useful formulae and tables. Drugs and drug distributors are listed in index and a bibliography is included. All dentists aside from the study of the listed drugs, owe it to their profession to be familiar with the activities of the Council.—*Lt. Col. J. E. Chipps DC U S A.*

**Militant Angel**, by *Harriet Berger Koch* R. N. 167 pages. The Macmillan Co. New York, N. Y. publisher 1951. Price \$3.

This is a warm and interesting biography of Anne W. Goodrich the nursing profession's reformer from New York. It is also a story of the development and improvement of nursing education in America. The whole aim of this biography writes Mrs. Koch in the preface "has been not merely to present the facts as they occurred but to help interpret them in the light of Miss Goodrich's own warm dynamic personality to present her, not alone as a pioneer in the field of nursing education or as a symbol of nursing in America but the very real, human person that she is with ideas, hopes, fears and plans for the future. The early years and later achievements through long-range vision, determination, and perseverance are described. Miss Goodrich is followed entertainingly yet accurately through the progress of nursing education from its humble beginning when nursing students were trained on a janitorial level, to its present position and standing in the educational field. The whole transition from a purely apprentice type of learning to the academic training which mark today's standards is traced. Mrs. Koch has carefully selected and annotated her material and has told her story concisely. The titling and summarizing of the chapters facilitate reference. The book was not intended as a text but is excellent background material and would be an asset to any nursing library. It is small easily handled, and the paper and print are of good quality. The book has an index and an extensive bibliography.

—*Capt. F. P. Thorpe U S A. F. (AFNC)*

**Exodontia** by *M. Hillel F. Idman*, D. D. S., F. I. C. A., Director of Dentistry, Lincoln Hospital, Department of Hospitals, City of New York, Dilectus of the Board of Oral Surgery, Seat of New York, Fellow of the International College of Anesthetists; Founder of the American Society for the Advancement of General Anesthesia in Dentistry; Honorary Member, American Society of Anesthesiologists; with chapter on Dental Malpractice Jurisprudence by *Michael A. Hays*, A. B., L. L. B., Member of the New York Bar, 4th edition, thoroughly revised, 290 pages, with 322 illustrations, Lea & Febiger, Philadelphia, Pa. publishers, 1951. Price \$6.50.

In this new edition of the well-known text on exodontia, Dr. F. Idman has made a complete revision of the content and has changed many of the illustrations to show the modern concepts of surgical procedures. The book is well planned, clearly written and covers the subject thoroughly. The author takes great pains to impress the reader with the necessity for complete understanding of the psychic reaction which occurs in mismanaged patients. He outlines definite indication necessitating extraction of teeth, also the significance of roentgenographic examination of occlusal and buccal positioning of teeth. One chapter devoted to description of instruments and forceps, including the well-known patholevers which he designed. His reliance on these patholevers and his teeth stand for them is apparent throughout his discussion of the removal of buccally positioned teeth and root fragments. The latter part of his book deals with accidents occurring in operative procedure and postoperative manifestations following tooth removal. He also expresses enthusiasm for the use of special surgical bars which he designed for exodontic operations, preferring them to chisels in the removal of bone and sectioning of teeth. The last chapter which now discusses dental malpractice.

—Lt. Col. F. H. Richardson, U. S. A. F. (DC)

**Bacterial Polysaccharides: Their Chemical and Immunological Aspects** by *Martin Burger*, formerly Organic Chemist at the Bureau of Laboratories, New York, N. Y. 272 pages, illustrated. Charles C. Thomas, Springfield, Ill., 1950. Price \$6.

This is a didactic but readable text which traces the history and summarizes the present day data of the bacterial polysaccharides. The volume may serve as a reference text and also as a guide to additional study. The author presents his own view on some instances but on controversial subjects these are clearly delineated and the entire field is presented for analysis. The work appears in that the world literature is covered and the significant findings are presented in terse and concise manner. The up-to-date, formidable summary of fundamental investigation in this field which is of interest to the postgraduate. —Lt. Col. R. W. Satterthwaite, MC, U. S. A.

**College Health Knowledge Test, Personal Health-Form A** by *Terry R. Drennon*, Ed. D., University of California, Santa Barbara College, Santa Barbara, Calif. 11 pages. Stanford University Press, Calif., publishers, 1950. Price 25 copies \$2.50; 50 copies \$3.50; 100 copies \$5.50; or more copies, \$5 per hundred.

This test consists of 100 questions each followed by 5 suggested answers, only 1 of which is best. It is divided into 11 sections: (1) occlusal and biological background, (2) nutrition and diet, (3) excretion and leanlines, (4) exercise and body mechanics, (5) fatigue and rest, (6) mental hygiene, (7) reproduction and heredity, (8) prevention and control of disease, (9) hygiene of eyes, ears, and teeth, (10) hygiene of environment, and (11) the use of medical care. The test may be used to the opening of a course in personal hygiene to reveal the actual achievement of the class and gain the end to indicate how successful an instruction has been. It may also be used to show which students are weak.

in certain subjects. An answer key is provided and suggestions are given for scoring the test. Although it is not intended that a time limit be placed on the completion of the test, it ordinarily requires from 40 to 50 minutes. It was constructed for students of college level. It is sufficiently comprehensive and technical that it is doubtful that many physicians without a recent refresher course would make a perfect score. This is especially true since a few questions are either poorly worded or controversial. There is also a certain amount of overlapping. This test should prove valuable to those teaching hygiene in senior high school or college.—*Col. W. G. Brandstadt, MC, U. S. A.*

**Introduction to Surgery** by *Virginia Kneeland Frenz, M. D.*, Associate Professor of Surgery, College of Physicians and Surgeons, Columbia University; Associate Attending Surgical Pathologist, Presbyterian Hospital, New York; and *Harold Doris Harvey, M. D.*, Assistant Professor of Clinical Surgery, College of Physicians and Surgeons, Columbia University; Associate Attending Surgeon, Presbyterian Hospital, New York. 233 pages. Illustrated. Oxford University Press, New York, N. Y. publishers. 1951. Price \$2.75.

This little book will find its chief use in preparing the preclinical medical student for his clinical education in surgery. Most subjects are discussed in language which should be well within the grasp of the preclinical student. A broad review is made of surgical principles and a few applications to minor surgery are demonstrated. No attempt is made to cover the special surgical fields in any detail. From the standpoint of the graduate physician too many subjects including surgical technique are considered too briefly. Some subjects such as trauma, shock and burns are too lightly covered to give even the student sufficient information for evaluation and correlation of the things he already has learned of these subjects. The illustrations are in the form of pencil sketches and are few in number. Frequent cross references within the book and mention of topics followed by statements such as "this will be discussed later" are undesirable. On the other hand, inflammation and wound healing are well discussed in detail. An attempt is made which is only mildly successful to present surgical principles in a way which will relate the student to the problems he will encounter. The book is not well enough organized to be used as a standard text.—*Lt. Comdr. J. F. Adams, MC, U. S. N.*

**The Eye Manifestations of Internal Diseases (Medical Ophthalmology)**, by *I. S. Tassman, M. D.*, Associate Professor of Ophthalmology, Graduate School of Medicine, University of Pennsylvania, Philadelphia. Philadelphia Attending Surgeon, Wills Eye Hospital, Philadelphia, Pa. 3d edition. 672 pages with 279 illustrations including 25 in color. The C. V. Mosby Co., St. Louis, Mo., publisher. 1951. Price \$12.

This new edition brings up to date an excellent book written for both the ophthalmologist and the general practitioner. The book purposely omits the details of the standard texts of ophthalmology in order to cover in a comprehensive manner the co-ordination between the multitude of internal diseases and their ocular manifestations. As a ready reference in medical ophthalmology it fills a definite need both for the specialist and the general practitioner. The first part of the book is devoted to the anatomy of the globe and orbit, the more common methods of examination of the eye and structural abnormalities and their manifestations. The chapter on congenital and hereditary ocular manifestations is complete and particularly valuable. The section devoted to infectious and infectious diseases included a wealth of material. Each disease with its ocular manifestations is concisely but adequately covered. The last portion of the book is devoted to diseases of the blood, pregnancy, endocrine glands, the nervous system, and skin. This book includes the most recent concepts regarding glaucoma and several of the more recently described and controversial entities such as retrolental fibroplasia. The illustrations are simple and well selected.—*Lt. Col. J. H. Bristow, U. S. A. F. (MC)*

A Handbook of Space Flight, by Wayne Proell, Editor Journal of Space Flight, and Norman J. Baerman, Ph. D. Editor Rock & Abstract 185 p. Perseus Publishing Co. Chicago, Ill. publishers, 1950. Price \$3.50.

This small volume contains considerable amount of information of the most reliable latest research and development in the field of space flight into space under gravity-free conditions. Divided into four parts, the 94 tables are devoted to properties of material and the physical, astronomical, and rocket phenomena involved in this subject. Data on lunar gravitational potential, solar and escape velocities, trans-lunar velocity of atom, ionization temperature, light properties, and meteoric information are also included. There is a glossary of terms used in this research and a list of rocket and space flight societies. Though of interest and participation in the field of space flight is growing, the appeal of this book is still limited among physicians. As reference manual, however, it is of interest to those who are concerned with the broader scope of aviation medicine and flight beyond the stratosphere.—Col. R. J. Bradford U S A F (MC)

The Education of Nursing Technicians by Mildred L. Montag, Ed. D. & N. Assistant Professor of Nursing Education, Teachers College Columbia University formerly Director School of Nursing, Adelphi College. Foreword by R. Louis McManus Ph. D. & N., Professor of Nursing Education and Director Division of Nursing Education, Teachers College Columbia University 146 pages. G. P. Putnam Sons New York publishers 1951 Price \$2.50

This report of study made by the author presents completely new ideas of the education of nursing technicians. Professor Montag proposes three distinct types of nursing service available. Simple functions would be performed by the practical nurse or nurse aide. Intermediate functions requiring highly technical nursing measures would be performed by group known as nursing technicians and this report enters on the proposed education of this type of nurse. Complex functions requiring great deal of insight and judgment, the ability to plan for general nursing needs and to solve nursing needs and to solve nursing need and to solve nursing problems supervision, teaching, planning community health with the aid of other groups and the execution of nursing duty which require proficiency and scientific knowledge would be the responsibility of the professional nurse. She would receive her education in medical college and have the least matter of degree in nursing education.

Because the greatest volume of nursing service falls within the range of semi-professional or technical function the author proposes a new type of nursing education for this group. Instead of the customary 3-year period in hospital school of nursing to give to the community college or junior college provide technical nursing education. She outlines a plan for 2-year course the graduate of which would receive associate degree. General educational courses would be taught by appropriate faculty members and nursing subjects would be taught by professional nurses. The demonstration and practice of nursing technique would take place in laboratory hospitals clinic and service would provide the clinical experience. Three hours of clinical experience are suggested for each hour of lecture. The author states that the shorter time spent in preparation for the type of nursing service rendered by this group. At present this is only plan for the definite educational advantages. It is doubtful however that this will decrease the cost of nursing service and the time allotted for clinical experience is too limited to develop real nursing skill.

—Capt. Fanny E. Vlahos U S A F (AFAC)

**The Differentiation of Escherichia and Klebsiella Types** by F. Kauffmann, M. D. Chief, International Salmonella Center, State Serum Institute, Copenhagen, Denmark. Publication Number 84 American Lectur. Series. 57 pages. Illustrated. Charles C. Thomas, Publisher, Springfield, Ill. 1951. Price \$2.

This booklet presents in brief form the author's concepts of the differentiation of organisms in the tribe *Escherichieae*. In line with the recommendation of Edwards in 1929 and the subsequent trend to which Dr. Kauffmann's work has given impetus, the *Aerobacter* and *Klebsiella* are combined in one genus whose characteristics include encapsulation, lack of motility, failure to produce indole, growth on Simmons citrate agar, and fermentation of adonitol and inositol. The name *Klebsiella* has priority preference over *Aerobacter*. The material is clearly presented in outline form and can be followed readily by workers having some familiarity with the field, but this manual is by no means intended for the novice. The table of biochemical reactions and the antigenic schema are easily read. Some tables are not numbered, however, and more careful editing would have improved the text. The use of meat extract in media for fermentation tests is questionable.

Biochemical reactions are used chiefly for characterizing an organism as a possible member of either genus. Antigenic characteristics define groups and types. Groups are established in each genus on the basis of somatic (O) antigens. In the *Escherichia* these are subdivided on the basis of envelop and capsular (K) and flagellar (H) antigens. An extended diagnostic antigenic scheme for the *Klebsiella* is based on O and K antigens. A more simplified scheme which employs only the capsular (K) antigen also is given. *Klebsiella* capsule types 1, 2, and 3 generally are virulent for mice and, in man, usually are associated with respiratory infections. These correspond to the familiar types A, B, and C. Capsule types 8, 9, and 10 are nonvirulent for mice and usually are associated with infections of the human urinary tract. Some O and K antigens are common to both *Escherichia* and *Klebsiella* organisms, but are given different numbers in each genus. This practice is questioned and might be voided by designating *Klebsiella* groups independently of the O antigen numbers.

This booklet presents the essential of bacteriologically important work, much of which has been available hitherto only in Scandinavian journals. A few pages are devoted to *Escherichia* strains isolated in outbreaks of infantile gastro-enteritis.—Lt. Col. L. R. Kuhn, MSC, U. S. A.

**Brain Metabolism and Cerebral Disorders** by Harold E. Himwich, M.D., Chief, Clinical Research Branch, Medical Division, Army Chemical Center, Md. 451 pages. Illustrated. The Williams & Wilkins Co., Baltimore, Md. Published 1951. Price \$6.

The author's purpose in this book is to review the contributions to the subject of brain metabolism that have been made in recent years and were previously found only in journals. The beginner in the field of Neurophysiology, neurology, and psychiatry will find here a clear unfolding of the basic principles involved in an understanding of cellular physiology. The clinician who seeks a better understanding of the pathologic and distorted physiologic processes of the diseases that he encounters at the bedside will profit by reading this book. It is divided into two parts, the first being devoted to energetics and the second to the pattern of nervous activity. The first portion discusses the methods by which energy is elaborated as well as distributed to support nervous activity. The second portion clearly explains the application of energetics in terms of behavior.

This book can be recommended highly to beginners and to those more advanced in the fields of neurology and psychiatry and all the various ancillary groups associated with these fields.—Col. S. C. Sutter, MC, U. S. A.

**Annual Review of Microbiology** by *Cheril E. Clifton*, Editor, Stanford University; *Sidney Raff*, Associate Editor, Stanford University; *H. Albert Barker*, Associate Editor, University of California. Volume IV 333 pages. Annual Review Inc., Stanford Calif., publishers, 1950. Price \$6.

This new edition is similar in format and subject matter to the previous three volumes. As is true of the other reviews most of the material covered is highly specialized and not intended for the beginner. In each of the classifications covered, certain amount of previous knowledge is required for understanding. A few of the chapters presuppose detailed knowledge of the field. The most peculiar will, however, find several general subjects covered thoroughly including historical summary of previous work. Extensive bibliography are given.

The subjects covered include: electron microscopy of micro-organisms and viruses, bacteriophages, constituents of mycobacterium, metabolism in protozoa, bacterial metabolism, newer antibiotics, genetics of micro-organisms, growth of viruses, current trends in experimental research on quaternary mycology, the development of bacteriophage, resistance to chemotherapy, great chemotherapy of virus and chemical reactions, antibiotics in relation to plant diseases, immunological reactions in viral diseases, the immunology of the human mycotic, rickettsial, brucellosis, and the influence of nutrition in experimental infection. The book includes an extensive subject index and subject index which, together with the bibliography, afford rapid means of further investigation into any of the fields covered.

—*May G. B. Stan II, MC, U. S. A.*

**Somati Development of Adolescent Boys: A Study of the Growth of Boys During the Second Decade of Life** by *Herbert Russell Stolz, M. D.*, and *Lois Meek Stolz*. Pp. D 557 pages, illustrated. The Macmillan Co. New York, N. Y., publishers, 1951. Price \$9.

It has been less than 100 years since Quetelet first recorded data on the weight and height of French children at different ages. Reliable information on the somatic development of infants and children has come very slowly, most of the data being anthropological. It has only been in the last 15 or 20 years that the more useful dynamic approach to growth has been emphasized. Dr. Stolz and others have provided such data and means for the pyramidal of the growth of infants and children. This volume by Stolz and Stolz provides similar information concerning the growth of adolescent boys thereby filling a gap in our knowledge of somatic growth. Men's measurements on a group of 67 boys was recorded every 6 months for 7 years. If the data is lowered at 18, our understanding of the individuality of somatic growth in the adolescent period is essential for the counselling guidance and training of American youth. —*Lt. Col. L. J. Geppert, MC, U. S. A.*

**Orthopaedic Nursing**, by *Frederick J. Knoche, M. D.*, Adjunct Orthopaedist, Lenox Hill Hospital, Attending Orthopaedic Surgeon, Instructor for the Crippled and Disabled, Instructor in Orthopaedic Surgery, Columbia University, New York; Diploma, American Board of Orthopaedic Surgery; and *Leila S. Knoche, R. N., B. S.*, Formerly Head Nurse, Women's Surgical Ward, Lenox Hill Hospital, Clinical Instructor in Orthopaedic Nursing, Hospital for Special Surgery; Instructor (part time) in Nursing Education, Teachers College, Columbia University, New York. 682 pages, 312 illustrations. F. A. Davis Co., Philadelphia, Pa., publishers, 1951. Price \$5.

This book stresses the importance of considering the patient as a whole. To develop this theme chapters are contributed by psychologists, physical therapists, and occupational therapists. The introductory chapter on the

historical foundation and modern trends is particularly valuable because it orients the student to the various civic organizations that aid in the care of the handicapped. Because of its excellent reference material and questions this book will be especially useful to instructors.

—Lt. Col. B. Elmer U. S. A. F. (AFMC)

**Physical Examination in Health and Disease** by *Rudolph H. Kampmeier* A. B. M. D. Associate Professor of Medicine Vanderbilt University School of Medicine; Visiting Physician to Vanderbilt University Hospital, Chief of the Medical Outpatient Service Vanderbilt University Hospital, Nashville, Tenn. 821 pages; 550 illustrations, 1 in color F. A. Davis Company Philadelphia Pa. publishers 1950 Price \$8.

This is an orderly presentation of the fundamentals of physical diagnosis attended by an introduction to clinical medicine for the second year medical student. It begins with an adequate discussion of the nomenclature followed by a brief consideration of the body in action emphasizing neurologic function and a description of the technique of the physical examination by regions, defining first the normal then describing various departures from the normal. Many excellent photographs illustrate the text. The appeal of this book will be limited because it is concerned explicitly with essentials and admittedly does not attempt to span the entire field of physical diagnosis. The author succeeds very well in his limited purpose.

—Commander J. A. Forte J. MC, U. S. N.

**The 1950 Year Book of Orthopedics and Traumatic Surgery** (November 1949–November 1950), edited by *Edward L. Compere* M. D. F. A. C. S., Associate Professor of Bone and Joint Surgery Northwestern University Medical School, Chairman, Departments of Orthopedic Surgery Wesley Memorial and Children's Memorial Hospitals, Consultant Orthopedic Surgeon Chicago Memorial Hospital, Consultant in Orthopedics, U. S. Naval Hospital Great Lakes, Ill. 388 pages; illustrated The Year Book Publishers, Inc. Chicago Ill. publishers 1950. Price \$5

This book covers the orthopedic literature from November 1949 to November 1950 and includes many abstracts from foreign sources. A quiz sheet containing 20 questions is supplied so that the reader may appraise his current knowledge. The roentgenograms and technical illustrations are well reproduced. The editor footnotes following many abstracts are interesting and instructive. The book opens with a special article entitled *Progress in Orthopaedic Surgery 1940–1950*. The remainder is divided into sections on poliomyelitis; congenital deformities; embryology; physiology and anatomy of the skeletal system; the epiphysis; osteomyelitis and other infections; tumors, cysts and fibrodysplasia; arthritis and rheumatism; fractures; the spine and pelvis; the neck, shoulder and arm; the hand; the hip; leg and knee; the foot and ankle; amputations and prostheses; surgical technique; instruments; appliances; and bone banks and miscellaneous. The Year Book may be considered a standard text in a residency training program and may be used to advantage in journal club reviews of the current literature. —Col. H. S. McBurney MC, U. S. A.

**Perspectives in Human Malnutrition**, A contribution to the Biology of Disease from a Clinical and Pathological Study of Chronic Malnutrition and Pellagra in the African by *Joseph Gillman*, D. Sc., M. B. B. Ch. and *Theodore Gillman*, M. Sc. M. B. B. Ch. Departments of Physiology and Anatomy Medical School, University of the Witwatersrand, Joint Nutrition Unit of the Council of Scientific and Industrial Research and the University of the Witwatersrand, Johannesburg, South Africa. 584 pages; illustrated. Grune & Stratton New York, N. Y. publishers, 1951. Price \$18.



The authors state that their main objective in writing this book were (1) to focus attention on the changing pattern of the clinical and pathological manifestations of chronic malnutrition and pellagra in Johannesburg South Africa at various periods of life (2) to see the clinical and pathological findings at different stages of the syndrome in terms of modification of physiological regulations and (3) to ramify the possibility that chronic malnutrition, apart from being causally related to specific nutritional syndromes, affects the life cycle of a person in such a way as to facilitate the emergence of some diseases, not usually regarded as etiologically related to nutrition, while excluding others. They accomplished this objective in detailed discussion, excellent comments, and many illustrations of the diverse clinical and pathological manifestations of nutritional disease. A departure is made from the usual practice of describing the signs and symptoms of malnutrition in terms of specific dietary deficiencies. This is done for this departure appears to be sound.

A unique feature of the book is the author's view of the reaction of malnourished persons in terms of modification of physiological regulation. They use Adolph's definition of the term *regulations* which is "a correlation of activities whereby some property or component (of the organism) is self-maintained. They add to this stating that regulation also exists in disease. The authors recognize two broad categories of regulations. The first apply to the organism at a given moment, and the second to the serial pattern characteristic of its development, which is immediately dependent on the first category. The first category is further broken down into three grades: (1) survival in a very restricted environment; (2) survival in a less restricted environment; and (3) survival in a widely fluctuating environment. They point out the effects of heredity, diet, and environment on regulations, and then on the life cycle.

A large portion of the book is devoted to pellagra. One entire chapter is devoted to describing the disease and pointing out the inconsistencies that exist in its diagnosis. The authors believe that unless the dermatosis is present then the nutritional syndrome should not be regarded as pellagra. They discuss the diagnosis of pellagra, its geographic, climatic, and seasonal distribution, the histopathology of the skin, reactions of the alimentary tract, the liver, the prostatic and maternal balance of the bone plasma and tissues, the endocrine system, and finally its treatment.

Much space is also devoted to malnutrition other than that which leads to pellagra. Particular attention is given to chronic malnutrition which is quite prevalent in South Africa. Comparison is also made of the various types of malnutrition which exist in different areas of the world. The final chapter discusses the prevention and limitation of malnutrition. In addition to the general principles presented, the most noteworthy observations made which are too frequently overlooked, are the fact that (1) there is no cheap substitute for good mixed diet; (2) diet can be deficient not only by virtue of deficiencies, but also by virtue of its content; (3) the conditions in which societies biologically as well must always be established spontaneously otherwise much harm may be inflicted on the organism; (4) among people who malnourished for one or two generations the adult already harbors such reserves as in many organs that chance cures are at present remote; (5) the science of nutrition till in its infancy and (6) we are still very ignorant about the principles of nutrition.

This book should be required reading for all students of human nutrition, particularly those who may be concerned with chronic malnutrition or the nutrition of large population groups.—Wes. L. M. Parrott, U. S. A. F. R. (NSC)





# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
Agency Department of Defense*



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THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY  
THE DIRECTOR OF THE BUREAU OF THE BUDGET OCT 19 1949

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON 1951

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

The Chairman of the Armed Forces Medical Policy Council and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy and Air Force to submit manuscripts for publication in this JOURNAL.

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ARMED FORCES MEDICAL POLICY COUNCIL  
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MEMORANDUM Personnel of the Medical Services of the United States Armed Forces

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Field medicine must be restored to the same high level of professional recognition and accomplishment as our definitive and specialist program. The Armed Forces Medical Policy Council will foster a program of integration and coordination of the military medical services, including an adequate, able reserve program to support the combat forces.

@ Randolph Lovelace II

2. Randolph Lovelace II, M.D.  
Chairman

# UNITED STATES ARMED FORCES MEDICAL JOURNAL

Volume II

July 1951

Number 7

## Acute Head Injury<sup>(1 2)</sup>

Joseph P. Evans M. D. (3)

Henry W. Ryder M. D. (3)

F. Votmar Kristoff M. D. (3)

Frank F. Espey M. D. (3)

Fariss D. Kimbell, Jr. M. D. (3)

THE HEAD wounds of warfare do not differ in essentials from those of civil life but they do differ in severity and in concentration of cases of particular character. With the mechanization of modern warfare many of the typical injuries of civil life in our motorized age are carried over into military life. Penetrating wounds and particularly those associated with the carrying in of foreign bodies form a much higher proportion of cases for the military than for the civilian surgeon.

We believe that it is a useful analytic technic to consider injuries to the head under four general categories each dealing with a major form of trauma. Any patient may present injuries falling into one or more of these categories. Such divisions are useful only if they facilitate thinking and if they are accompanied by a clear-cut synthesis which permits the wrapping of the problem as it were into one package. The surgeon must constantly bear in mind the influence of injuries to other parts of the body: thus primary shock, fat embolism, the influence of respiratory obstruction in complicating nervous system injury are all matters of vital significance but all of our thinking in relation to head injury ought properly to be based on clearly conceived physiologic concepts brought realistically to bear on the clinical problem at hand. The four categories are scalp injury, fractures of the skull, meningeal hemorrhage and brain injury proper. For the sake of completeness only we shall make brief allusion to the first two groups.

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(1) Based on paper read by Dr. Evans at the Monthly Medical Meeting, Army Medical Center, Washington, D. C. 15 February 1951.

(2) The investigative work reported has been carried out under terms of contract with the Surgeon General's Office, Department of the Army.

(3) Division of Neurosurgery, Department of Surgery, College of Medicine, University of Cincinnati, Cincinnati, Ohio.

## SCALP INJURIES

Injuries to the scalp are of importance primarily because they may expose the inner structures to infection, because they may be the source of serious bleeding, or because they may involve serious cosmetic sequelae. Even simple scalp wounds deserve careful surgical attention for a simple injury badly handled may lead to most serious sequelae. As an example, the following case may be cited.

## CASE REPORT

*Case 1*—A 2-year-old boy was struck in the left frontal region by a swing. The skin was apparently only bruised but in the next week the contused area became infected and was apparently incised inwardly. Subsequently he developed osteomyelitis and a left frontal lobe abscess. Removal of the osteomyelitic bone became necessary and the abscess was drained. An obliterative leptomeningitis developed about the base, hydrocephalus ensued, and it became necessary to perform a third ventriculostomy to permit the by-passing of fluid about the site of obstruction.

About a year and a half following this successful operation a cranioplasty was performed and for a time thereafter life was uneventful for him. Subsequently he developed convulsive seizures of both the grand mal and psychomotor type. These attacks proved resistant to medical treatment and special schooling became necessary because of them. The psychomotor seizures were accompanied by a rage reaction and despite valiant psychotherapeutic efforts his conduct deteriorated and the boy was committed to institutional care by the probate court. Eventually the left frontal lobe, the site of the original abscess was resected following which he improved but still required supervision. When he was 12 years old another child in the institution struck him. The wound broke down over the tantalum plate, and the plate had to be removed.

*Comment.*—The discomfort of the child, the disruption of the life of his family, the countless hours of professional care and the economic waste to the community are elements difficult to evaluate. This is cited to emphasize the seriousness of scalp injuries.

## SKULL FRACTURE

The importance of skull fractures has been over-emphasized. There is a popular misconception in the lay mind, particularly in that of the lawyer, that skull fracture is necessarily accompanied by grave consequences. Table 1 gives a simple classification of skull fractures and points out the circumstances under which fractures become of importance. For the military surgeon, penetrating wounds which break the continuity of scalp and skull which introduce foreign bodies and infection, or which are treacherous by virtue of the velocity and the mass of the invading missile are of the greatest importance but may be interpreted in terms of general principles. The nature of the skull fracture

serves in a rough way as an index of the severity of the injury. One must guard against infection which may result from compounding of the wound, either to the exterior over the convexity or to the hidden cavities of the head (the nasal sinuses or the middle ear structures). One must beware of extradural clot, precipitated by fracture rupturing one of the major meningeal vessels and one must recognize that a brain wounded by a depression may demand, because of potential swelling more room than the compromised brain case can offer.

TABLE 1 —*Classification of skull fractures*

A. Closed.

- 1 Simple linear fracture
- 2 Simple comminuted (egg-shell) fracture
- 3 Complicated linear or comminuted fracture
  - a. Across the middle meningeal artery
  - b. Across the major venous sinuses such as the median longitudinal sinus
  - c. Across major neural structures such as the olfactory nerve
  - d. Depressed.

B. Compound fractures

- 1 Simple
2. Comminuted
- 3 Depressed.
- 4 Through the accessory nasal sinuses or the petrous bone

## MENINGEAL HEMORRHAGE

The subarachnoid spaces are surgically inaccessible because of their narrowness and their trabeculated configuration, but another and more important reason why subarachnoid hemorrhage does not, of itself constitute a surgical entity is that the spaces are lined with reticulo-endothelial cells which because of their phagocytic capacity are far better able to clear the spaces of red blood cells than is the most active surgeon (4).

From the practical point of view epidural and subdural clots are much more important than subarachnoid hemorrhage. Such accumulations may occur on either side of the dura. Bleeding which occurs in the epidural space is almost always of arterial origin and is derived from one of the major meningeal vessels. Therefore it almost always accumulates rapidly. Bleeding into the epidural space sometimes appears to occur from external tears of one of the major venous sinuses (5). Most epidural clots accumulate in the temporoparietal region. Occasionally aberrant hemorrhage may be found over a frontal or occipital lobe and, rarely over the cerebellum. The blood in escaping from its vessel dissects

(4) Sprong, W. Disappearance of blood from cerebrospinal fluid in traumatic subarachnoid haemorrhage: Ineffectiveness of repeated lumbar punctures. *Surg. Gynec. & Obst.* 58. 705-710 Apr. 1934.

(5) Macrao D. and Melby G. L.: Extradural hemorrhage: study of 44 cases. *Ann. Surg.* 113. 192-203, Feb. 1941.

the dura from the undersurface of the skull and acts as a rapidly accumulating space-consuming lesion with dire consequences to the underlying brain.

Accumulation of blood in the subdural space is derived from one of two sources or a combination of the two. The major cortical veins in traversing the subdural space from the surface of the brain to the dural sinuses are practically devoid of support. Their points of entry into the venous sinuses are fixed whereas the brain itself is free to move within the brain case. Therefore in a head suddenly arrested in motion the superior longitudinal sinus with its attached entering veins is also arrested. The brain, however, is free to move in a rotary direction so that the thin-walled bridging veins may be stretched unduly and if torn may give rise to rapid accumulation of clots.

The second source of bleeding into the subdural space is cortical contusion with tearing of the leptomeninges and the cortical vessels. We have exposed such torn vessels at operation.

We believe that it is often impossible to differentiate between an epidural and a subdural clot. The clinical findings in the two conditions are very little different, except that, in general, the epidural clots tend to accumulate more rapidly than their counterparts on the inner side of the dura. It is a mistake to attempt to delineate a classical picture of meningeal clot. We believe it better to attempt to visualize the clinical findings in terms of the functional disturbance that develops as the clot accumulates. Consciousness may have been lost at the time of injury. If not, it becomes obtunded and as bleeding progresses may be lost progressively. Compression of the underlying motor cortex produces a contralateral paresis which progresses to hemiplegia. The space-consuming clot shifts the underlying brain and the brain stem to the opposite side and stretches the third nerve on the side of the clot so that it may be thrown out of function and a dilated pupil may develop on the same side (fig. 1). Further shift of the brain results in compression of the venous outflow from the midbrain region, the thin-walled veins being obliterated by the advancing uncus, pushing against the midbrain itself. Apparently as a result of this compression venous back pressure hemorrhages occur in the midbrain at the level of the third nerve nuclei, and because they may occur in varying degree on either side of the midline they provide a second source of pupillary irregularity and explain the fact that meningeal clots are not always found on the side of the dilated pupil.

Similar lesions at this level are the cause of clinical decerebrate rigidity the lesion producing an accurate analogue of experimental decerebration.

It is then clear that the differentiation between an epidural and a subdural hematoma is largely an academic exercise. In both instances the mechanical problem is similar and the surgical implication is comparable. In the presence of such a clot, prompt action is imperative and



*Figure 1 —Cat brain surface viewed from the front showing herniation of the right cerebral peduncle and the right uncus. Accentuation of this process, particularly when associated with displacement of the midbrain structures, stretches the third nerve as it courses about the posterior cerebral artery and compromises nerve function, producing the Reid-Cone syndrome.*

this consists of an exposure of the subtemporal region (facilitated by the head rest shown in figure 2) which gives one ready access to the middle meningeal artery and gives one free access to the subdural space if one must search for another source of hemorrhage. All bleeding points derived from branches of the middle meningeal artery must be coagulated to prevent further bleeding. On the other hand, in most instances when bleeding has occurred into the subdural space the tamponade effect of the clot has shut off the offending vessel by the time surgical intervention is carried out. This however, is not invariably the case and it is the surgeon's responsibility to find the bleeding vessel or vessels and seal them before closing the wound. This must be accomplished even though the patient's condition be desperate because failure to do so will almost invariably result in re-accumulation of the clot and a further downward course.

Figure 3 illustrates the typical location of an epidural clot and shows the compression of the underlying hemisphere which compression can be expected to be responsible for contralateral hemiplegia. Figure 4 shows the shifting of the brain substance particularly of the brain stem, which occurs as a result of the demand for space made by the clot. It also demonstrates (1) the swelling of the white matter which adds further to

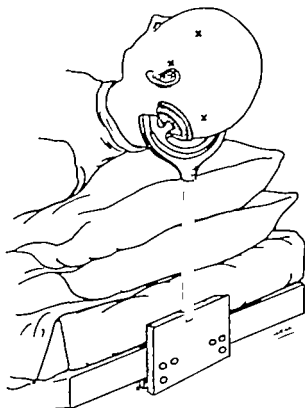


Figure 2.—Head rest designed by Dr. Richard U. Light.



Figure 3.—Epidural lot with cerebral compression.

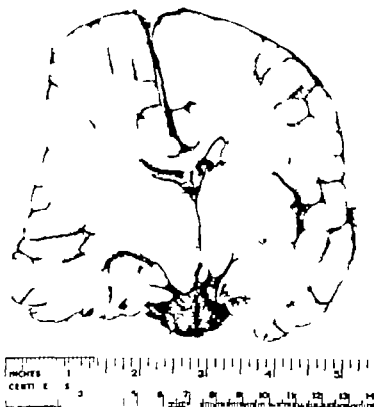


Figure 4.—Brain shown in figure 3 in cross-section.

the demand for space within the right half of the supratentorial fossa, (2) the herniation of the right uncus and right peduncle through the tentorium and of the right cingulate gyrus under the lower edge of the falx and (3) the ventricular compression

Figures 5 and 6 show variants of the same mechanism in a case of chronic subdural hematoma, a hematoma which though well tolerated immediately after the injury gave rise to trouble later because with the passage of time the free blood in the subdural space became encapsulated in an envelope. Presumably as the red blood cells finally broke down within the sac the osmotic action within the sac increased and tardily some months later the hematoma swelled beyond the point of tolerance and acute decompensation occurred (6). The patient whose brain is shown in these figures was injured in May by the hook of a travelling crane. He was not rendered unconscious and except for head ache he worked without complaint throughout the summer months, but in September in association with an exacerbation of his headache he became comatose and died within 24 hours following the onset of serious symptoms. His death occurred despite the fact that the hematoma was

(6) Gardner W. J.: Traumatic subdural hematoma, with particular reference to latent interval. Arch. Neurol. & Psychiat. 27: 847-858, Ap. 1932.



evacuated. His failure to recover indicates no doubt, that irreversible brain stem damage had occurred prior to the evacuation of the hematoma.

The brain tolerates compression very badly. When the compression occurs rapidly—as in association with an extradural clot accumulating over a period of a few hours—the tolerance is least. In the case of an acute subdural hematoma accumulating over a longer time the compres-



*Figure 5—The left leaf of the dura has been turned over the right hemisphere to demonstrate the nature of the underlying hematoma sac encompassing some residual clot not evacuated at operation.*

sion tolerance may be greater. In the case of chronic subdural hematomas, the clot may be tolerated for many months but eventually when the clot finally increases in size either because of the osmotic action associated with its breakdown or because of further bleeding into the hematoma sac the compensation may finally be broken acutely. Under these cir-

circumstances the sequence already described develops. The physiologic explanation of the deepening level of coma which occurs under such circumstances is a problem which will be discussed below

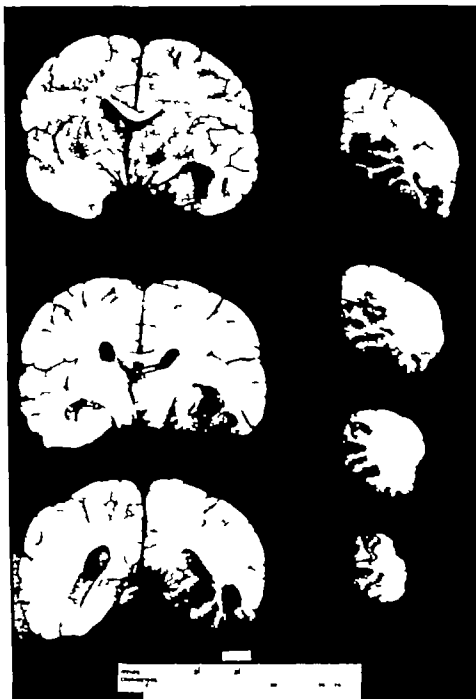


Figure 6.—Cross-sections of brain shown in figure 5. Note the swelling of the white matter and the shift of midline structures.

## BRAIN INJURY

One may consider injury to the brain substance itself to be divided into the following groups (1) concussion, contusion and its precursor state of edema, (2) laceration; and (3) coalescent multiple area of bleeding giving rise to intracerebral hematoma, a condition which also presumably may result from the rupture of a normal vessel when sufficient strain is placed on it.

Focal bruising and laceration of the brain may lead to focal cerebral cicatrix and its frequent physiologic counterpart, posttraumatic seizures. Furthermore diffuse injury to the brain such as may accompany widespread contusion may lead to a general loss of brain substance resulting in posttraumatic atrophy.

The term concussion as here used indicates a state of disrupted consciousness, transient in character and unaccompanied by demonstrable histologic change. Nothing can be done therapeutically about a state from which recovery has been made in most instances before the physician has a chance to observe the patient.

Enough has been said above in discussing the changes which go on underneath an epidural or subdural hematoma to indicate the reality of cerebral edema. In the early stages of our experimental work we attempted to produce cerebral edema but were unsuccessful in producing a reliable degree of swelling which could be determined by unprejudiced histologic observation. We think from the clinical point of view that edema is probably of chief importance as it occurs under such hematomas and that it may not be of such great significance in association with diffuse brain injury.

The clinical state of cerebral contusion or bruising of the brain is a straight-forward one which may or may not manifest itself on the neurologic examination, depending on whether or not the bruising has occurred in areas whose function can be detected readily. Thus bruising in the frontal region may escape detection entirely whereas a less severe contusion on in the motor area might be manifested by profound weakness. Whether the perivascular hemorrhages that characterize contusions are the result of direct tears in the vessel wall (7) or whether they represent diapedesis through vessels presumably damaged by the head injury (8) is still a moot point. Practically speaking such contusions must be allowed to resolve themselves in the course of natural healing.

Special attention, however, should be drawn to more extensive bruising which either through coalescence of many adjacent zones of peri-

(7) Denny-Brown, D. E.: Discussion of paper by Evans, J. P. and Scheinker, L. M. See reference footnote (2).

(8) Evans, J. P., and Scheinker, L. M.: Histologic studies of brain following head trauma, post-traumatic central nervous system change interpreted in terms of circulatory disturbances. *A. Research Nerv. & Ment. Dis. Proc.* (1943) 24: 254-273, 1945.

vascular hemorrhage or perhaps through the actual rupture of a vessel of some magnitude results in the development of a hematoma within the brain substance. This is a condition which may closely simulate epidural or subdural hematoma. Exploration for meningeal clot having proved negative the temptation is to do nothing further in the way of active surgical resolution of the problem. Such intracerebral clots however must be pursued vigorously and their identification accomplished either by ventriculography or angiography. In the past 2 years, on the neurosurgical service at the Cincinnati General Hospital, 12 epidural clots have been diagnosed and treated. During the same period, 17 intracerebral hematomas have been diagnosed and have been evacuated with an operative mortality of about 50 percent.

These cases are of particular importance because they are subject to active surgical intervention. To this group amenable to surgical therapy there should be added another the best examples of which are cases of contusion of the tips of the temporal lobes and the under surfaces of the frontal lobes injuries produced in contre-coup fashion when the patient falls on the back of his head. Such cases have been carefully studied by Botterell (9) who has shown that patients suffering from injury of this type are prone to show signs of increasing difficulty in the first few days after head injury and that death may be prevented by the generous aspiration of pulped temporal and frontal lobe tissue carried out through subtemporal openings.

Except for these two groups of cases and for those requiring evacuation of meningeal clot, there is relatively little that the surgeon can do to alter the situation. In most head injuries the die of future development has been cast when the blow has been delivered. In the present state of our knowledge the surgeon's chief function in dealing with such patients is to improve their general condition so that shock is eliminated to see to the maintenance of an adequate airway (which may on occasion mean tracheotomy), to provide for the general nutritional needs of the body and to provide the best possible nursing care preferably by specially trained personnel. Should the wound be compounded the role of infection becomes of paramount importance and in the case of open wounds removal of damaged tissue and of potentially infected foreign material becomes imperative. Adequate treatment of these patients necessitates considerable knowledge and judgment on the part of the surgeon.

Because suspended consciousness is such a frequent accompaniment of head injury knowledge of the mechanism of unconsciousness is important. The location of the centers which subserve consciousness has been a subject of much discussion. An increasing body of evidence suggests that the centers related to the sleep state and perhaps to un-

(9) Botterell, E. H. Disruption of frontal and temporal lobes: a cause of secondary coma following head injury. Presented at meeting of Harvey Cushing Society, November 14, 1947.

consciousness itself lie in the lower diencephalon and the midbrain. The recent work of Magoun (10) and Taylor and Magoun (11) indicates that the sleeping and waking states depend on physiologic iterations occurring at these levels. Widespread damage in this region, if this postulate be correct, would then be a source of unconsciousness by virtue of interruption of the physiologic mechanism subserving the waking state. Thus we would have an explanation of the deep coma which we are accustomed to see in the patients who display other signs of midbrain damage such as decerebration.

A second mechanism associated with loss of consciousness is that which accompanies severe injury to the body such as major fracture. O'Shaughnessy and Sloane (12) thought that such a loss of consciousness might result from a sudden inpouring of afferent impulses from the traumatized part which inpouring might be of sufficient degree to disrupt the handling by the central nervous system of the signals reaching it from the periphery. This is probably an oversimplification of the problem but it is perhaps permissible to repeat an analogy which has been previously suggested, that of the overloading of a central telephone switchboard by a sudden influx of calls. One is put in mind of the communications paralysis that occurred following Orson Welles' *Men of Mars* broadcast. The central nervous system does not have such a simple counterpart but the analogy highlights the loss of consciousness which may occur with severe peripheral injury, a loss which appears to occur too suddenly to be readily explained on the basis of vasomotor syncope.

The third mechanism is that which was elaborated by Denny-Brown and Russell (13). They had observed a mechanic whose head was crushed between a differential housing and the floor when a jack slipped from under the axle of the car on which he was working. Although he suffered severe injury to the skull manifested by bleeding from the nose and the ears, he did not lose consciousness. A consideration of this patient in contrast with those known to have lost consciousness in association with sudden arrest of the head (and body) as it was flying through space or in contrast with the boxer who when his head is suddenly accelerated by the blow of his opponent, loses consciousness, led them to set up experiments in which it was possible to demonstrate the basic importance of both sudden deceleration and acceleration of the brain. Their clarification of these effects has been of immense help in understanding more clearly what a moment's reflection will show is the commonest cause of loss of consciousness.

(10) Magoun, H. W. Caudal and cephalic influences of the brain stem reticular formation. *Physiol. Rev.* 30: 459-474, 1950.

(11) Taylor, C. W. and Magoun, H. W. The reticular rhombic of the brain stem and its relation to wakefulness. A paper read at meeting of the American Academy of Neurological Surgeons, September 1950.

(12) O'Shaughnessy, L., and Sloane, D.: Etiology of traumatic shock. *Br. J. Surg.* 22: 587-618, Jan. 1935.

(13) Denny-Brown, D. and Russell, W. R. Experimental cerebral concussion. *Brain* 64: 153-164, Sept. 1941. *Brit. Proc. Roy. Soc. Med.* 34: 691-692, Sept. 1941.

A fourth mechanism associated with loss of consciousness appears to be common to a number of clinical conditions and has been interpreted by many as a reflection of increased intracranial pressure. Reference has already been made to the deepening level of coma associated with epidural and subdural clots. Neurosurgeons not uncommonly find that a patient on the operating table regains consciousness when fluid under pressure is released from a chronic subdural hematomatous membrane. Other examples might be cited suggesting strongly that the release of increased intracranial pressure is associated with the return of consciousness. The following is a classical instance.

### CASE REPORT

*Case 2.*—A 10-year-old boy was operated on for atresia of the aqueduct of Sylvius subsequently proved to be caused by a tumor. An effort was made to ream out the aqueduct from the fourth ventricle forward. Postoperatively the patient appeared to do well through the afternoon and early evening of the day of operation but at about midnight his condition worsened and by 2 a. m. he was in deep coma, the reflexes both deep and superficial were absent, the extremities were flaccid and the blotchy appearance of the skin indicated peripheral circulatory collapse. The introduction of a needle into the ventricle was accompanied by a rush of air and fluid under pressure. The child shortly after began to stir. In about 2 minutes the deep reflexes had returned and in 4 minutes the child was conscious. Three other episodes occurred in which he became stuporous, lost his deep and superficial reflexes and developed cortical signs. In each instance following ventricular puncture his condition improved. The conclusion seems almost inescapable that his coma was directly related to the increased intracranial pressure.

It was partly in the effort to obtain more accurate data on the importance of intracranial pressure in neurologic lesions that we undertook our present study. The initial effort was directed toward the development of a method which would make possible the continuous recording of lumbar and ventricular pressures. It was thought that in this way we might among the answers to other questions find whether or not lumbar puncture is dangerous when the intracranial pressure is increased but as the work was further developed it became increasingly evident that a better understanding of the physiologic mechanisms supporting intracranial pressure was imperative. Hence the constantly recording techniques originally designed for determination of lumbar and intraventricular pressures were extended to provide observations on other variables particularly those which would give information dealing with cerebral hemodynamics. Figure 7 shows a strain gage attached to a needle. Changes in volume in the lumen of the needle caused by pressure changes within a fluid system affect the diaphragm of the strain gage and alter the electric resistance of the gage. In this way pressure changes may be recorded electrically. Out of this work is developing a large body of information dealing with intracranial pressure states in a variety of con-

ditions (14). A clearer understanding of the physiologic background of spinal fluid formation and absorption appears to be emerging. For the present purpose attention should be directed to what has been learned in relation to the effect of intracranial pressure on the state of consciousness.



Figure 7—Strain gage attached to a needle.

In 1901 Cushing carried out a series of observations on animals in which he indicated that sharp increases in intracranial pressure approximating the mean arterial pressure were associated with medullary col-laps (15). In the following year he drew a parallel between these observations in the experimental animal and the clinical state of patients suffering from intracranial hemorrhage (16). By inference it was suggested that increased intracranial pressure of significant degree occurred in these patients and was responsible in part at least for their disturbed states of consciousness.

On the other hand we have now developed data which indicate clearly that intracranial pressure of much higher values than those previously measured (figs 8 and 9), is not associated with alterations in the level of consciousness and it no longer seems tenable that increased intracranial pressure of the degree commonly associated with head injury is sufficient to disrupt consciousness (17). Hence we must seek another explanation of the coma commonly accepted as being caused by increased intracranial pressure.

It was suggested in discussing the first mechanism, that of injury which disrupted the midbrain centers presumed to be subserving con-

(14) Ryder H. V. Eassey F. F. Kristoff F. V., and Evans, J. P. Observations on interrelationships of intracranial pressure and cerebral blood flow. *J. Neurosurg.* 8: 46-59 1951.

(15) Cushing, H. Concerning definite regulatory mechanism of vasomotor center which controls blood pressure during cerebral compression. *Bull. Johns Hopkins Hosp.* 12: 290-292 1901.

(16) Cushing, H.. Blood pressure outcome (acute cerebral compression). *Ann. Am. J. M. Sc.* 125: 1017-1044, 1903.

(17) Evans J. P. Eassey F. F. Kristoff F. V. Kimball F. D. and Ryder H. V. with the technical assistance of Lamb, D. A. Barrows E. B. and Young, D. J. Experimental and clinical observations on raising intracranial pressure. (To be published in *Archives of Surgery*.)



Figure 8.—Amplifiers and 6-channel ink-writing oscillograph used in constant recording of the pressure changes in ventricles, lumbar subarachnoid space, brachial artery and jugular vein. ECG's may also be obtained as in this instance.

sciousness that these centers are related to those studied by Magoun and his collaborators in their investigation dealing with the sleep mechanism. We should like to suggest tentatively that it is these same centers which are affected when the midbrain is *displaced* by meningeal clots or other space-consuming lesions. There is no clear-cut evidence that high intracranial pressure is a prerequisite for disturbed function.

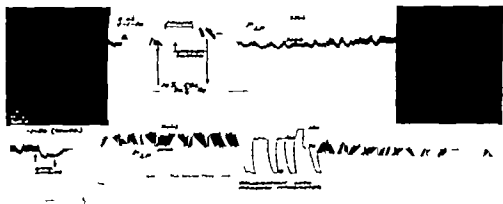


Figure 9.—An example of a single-channel tracing recording the lumbar pressure of a patient with increased intracranial pressure caused by a brain tumor. The tracing suggests the possibilities of the method for physiologic investigation.



of these centers. Possibly the compression of tissues or the compression of nutrient vessels is the important factor and possibly these disturbances are accompanied only *pari passu* by increases in intracranial pressure.

We have come then to the conclusion that increased intracranial pressure *per se* is not a matter of consequence in the range of pressure seen in anything other than the terminal stages of illness. We believe that for practical purposes increased intracranial pressure is of diagnostic value indicating something of the clinical state but not of itself constituting a threat to the patient's welfare. So far as head injuries are concerned this is a conclusion previously drawn by Browder and Meyers (18, 19) and Meyers (20).

We are anxious to extend these observations not only in relation to head injury itself but also in relation to other clinical states because we need to understand much more clearly the mechanisms behind the formation and absorption of cerebrospinal fluid and because the observation of pressure changes in a wide variety of states places our conclusions on firmer ground and gives greater credence to them. If we can conclude from these studies that increased intracranial pressure need no longer be a matter of grave moment for the neurosurgeon in evaluating therapy then the problem of the treatment of head injuries is much clarified and investigative efforts toward a better understanding of the condition may be directed into other channels.

#### SUMMARY

Any head injury is apt to present a complex clinical problem, subject to analytic study which study through its provision of a clearer understanding of the functional disturbance should make for a more rational therapeutic approach. The treatment of scalp injuries is a problem which demands the application of the best general surgical principles. Formidable plastic procedures may be necessary to restore the integrity of the scalp.

Skull fractures become of importance if they give rise to intracranial hemorrhage, to tearing of nerve tissue, to compression, or to the introduction of infection.

Chief attention has been directed toward meningeal hemorrhage and brain injury proper. On superficial consideration the first of these may be regarded as a simple mechanical problem demanding evacuation of

(18) Browder, J., and Meyers, R. Observations on behavior of systemic blood pressure and spinal fluid pressure following craniocerebral injury. *Am. J. Surg.* 31: 405-426, Mar. 1936.

(19) Browder, J., and Meyers, R. Behavior of systemic blood pressure, pulse rate and spinal fluid pressure associated with acute change in intracranial pressure artificially produced. *Arch. Surg.* 36: 1-19, Jan. 1938.

(20) Meyers, R. Systemic vascular and respiratory effects of experimentally induced fluctuations in intracranial pressure. *J. Neurophysiol. & Exper. Neurol.* 1: 241-264, July 1942.

the hematoma. Further analysis demonstrates that the problem is much more complex and that the significance of the hematoma depends primarily on the changes that it produces in the underlying brain.

With the exception of the evacuation of intracerebral hematomas and of pulsed brain tissue, there is relatively little which the surgeon can offer in treating brain injury over and above the natural healing processes. It is imperative that the patient be placed in the best general physiologic state. This means the elimination of shock, the provision of an adequate airway and the maintenance of the optimal metabolic state and a normal fluid intake and output. Intelligent and adequate nursing care is imperative.

Impairment of consciousness may result from (1) direct injury to those centers which subserve consciousness; (2) inaccurate bombardment of these centers by afferent impulses in association with peripheral injury; (3) sudden acceleration or deceleration; or (4) distortion of the midbrain structures. Our evidence would seem to indicate that when high intracranial pressure is distributed evenly it has no effect on the level of consciousness except perhaps when the intracranial pressure in a human being is raised to the point where it approximates the mean arterial pressure. We have no evidence in human subjects to bear on this last critical stage. It would seem, however, that for all practical purposes increased intracranial pressure is but an index of disturbance of cerebral function, and is not in itself significant. The elimination of increased intracranial pressure as a factor which needs in its own right to be considered in the treatment of head injury is an important step in the better understanding of such trauma and the planning of therapy.



# Hematology, Diagnosis, and Therapy of Radiation Injury<sup>(1)</sup>

Eugene P Cronkite *Commander MC, U S N*

FROM the practical standpoint, uniform whole-body exposure to ionizing radiation will rarely occur after an atomic explosion because of shielding of the body by concrete, steel, or other intervening objects. In the laboratory whole-body exposure to ionizing irradiation is so arranged as to deliver a field of radiation that is homogeneous with the aim of delivering equal amounts of radiation to all tissues throughout the body (2) (3). This does not occur however because the absorption of radiant energy varies with the tissue density. In the laboratory it is necessary to maintain uniform, reproducible conditions in order to study the effects of radiation. These laboratory conditions are not necessarily those which existed in respect to radiation exposures in Japan or which may occur at some future date.

The effects of shielding therefore become of great importance as shown by the fact that in guinea pigs the 50 percent lethal dose (L.D 50) of radiation is about 250 r. If the extremities are shielded, the L.D 50 is increased to 600 to 800 r. If the abdomen is shielded the L.D 50 dose may be increased to 1 000 r. In mice Jacobson (4) (5) has demonstrated that shielding of the spleen with exposure of the rest of the body almost doubles the 30-day L.D 50 for this species. Bond (6) has demonstrated in rats a great difference in the L.D 50

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(1) Presented part I course on Medical Aspects of Special Weapons Naval Medical School National Naval Medical Center Bethesda Md.

(2) Chapman, W. H. et al. Experimental procedures for exposure of large numbers of animals to total body X-radiation. Project 006 012 05.03 3 July 1950 Naval Medical Research Institute Bethesda Md.

(3) Chambers F. W., et al. Output characteristics of commercial X-ray generator 7 Dec 1949 Project 006 012 06.26 Naval Medical Research Institute Bethesda Md.

(4) Jacobson L. O. et al. Role of spleen in radiation injury Proc Soc Exper Biol & Med 70: 740-742 Apr 1949

(5) Jacobson, L. O. Simmons E. L.; Marks E. K.; Robson, M. J.; Bethard W. F., and Gaston, E. O. Role of spleen in radiation injury and recovery J Lab & Clin Med 35 746-770 May 1950

(6) Bond, V. P. et al. Sensitivity of abdomen of rat to X-radiation. Naval Radiological Defense Laboratory U S Naval Shipyard, San Francisco Calif. (To be published)

for rats with the abdomen shielded as compared to the L.D 50 with abdomen exposed. Similar studies have been performed shielding the adrenals, head, portions of the extremities and other organs. All shielding experiments tend to increase the resistance to radiation and to modify the response of the hemopoietic organs.

## HEMATOLOGIC EFFECTS OF RADIATION

*The mechanism by which radiation induces changes in the peripheral blood.*—There is no evidence that cells other than the lymphocytes in the circulating blood are injured by radiation in amounts of radiation that produce the lethal range. With supra-lethal amounts of radiation up into the thousands of roentgen units injury to the cells in the peripheral blood can be produced. This however is of no practical importance. The direct irradiation of blood cells in vitro or in ligated vessels with amounts of radiation that produce the lethal range does not produce morphologic injury of these cells in a reasonable observation period. All evidence points to destruction of the stem cells (blasts) as being responsible for the changes that take place in the peripheral blood (7) (8). In other words the changes in the number of cells in the peripheral blood of animals follow the normal attrition following cessation of production by the hemopoietic organs.

The injury to the blasts may result in (1) their complete destruction so that regeneration is unlikely; (2) their partial destruction; or (3) interference with their maturation. The relative injury to the formative cells determines to a large extent the changes in the peripheral blood. If erythroblasts are completely destroyed, the attrition of the erythrocytes in the peripheral blood will be a function of the life span of the erythrocyte unless other factors intervene. Similarly when production of lymphocytes, platelets or granulocytes ceases the rate at which they disappear from the circulating blood will be a function of their usual life span and the demand for these elements.

*Effects on the erythroid system.*—The erythroblasts are as sensitive as any of the blasts. Immediately after exposure to lethal amounts of radiation they show obvious signs of cellular injury such as pyknosis, karyorrhexis and disturbances in the chromatin pattern, cessation of mitosis and rapid disappearance. The changes in the level of erythrocytes in the peripheral blood are caused by (1) the cessation or interference with their production; (2) their increased destruction as manifested by marked erythrophagocytosis and increased urobilinogen excretion; and (3) profound hemorrhagic tendency that develops in most animals exposed to more than an L.D 50. The change in the level

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(7) Lawrence J. S., Dewey A. H., and Valentini V. N. Effects of radiation on hemopoiesis. *Radiology* 51: 400-413, Sept. 1948.

(8) Crookitt E. P. in Behrens C. F. *Anatomic Medicine*. Thomas Nelson & Sons, New York, N. Y. 1949 pp. 103-127.

of circulating erythrocytes is relatively slow because of the long life span of most mammalian erythrocytes. The human erythrocyte has a life span of roughly 120 days; therefore, under normal conditions in each person about 1 percent of the erythrocyte mass is destroyed and produced each day. It follows that if no erythrocytes are being produced, there will be a deficit of about 1 percent per day. Following exposure to lethal amounts of radiation, there is a minimum deficit of this 1 percent per day (in addition to the erythrocytes lost by their increased destruction and those lost by the hemorrhagic tendency or from wounds or other injuries) until regeneration occurs.

*Effects on the granulocytes* —The pattern of response in the granulocytes of the peripheral blood is a function of the amount of radiation that has been received. With very high doses of radiation, the drop is precipitant and takes place almost immediately, reaching the minimum value in from 3 to 4 days after exposure. There is no tendency for a rebound as is seen with lower doses of radiation such as the LD 50. The life span of the granulocyte has been estimated as being from 1 to 4 days. Hence, with no production, their disappearance will be rapid.

*Effects on the lymphocytes* —With doses of radiation above 50 r, the initial response of the lymphocyte is uniform. Immediately after exposure, there is a prompt drop in the lymphocyte count. The degree of the depression is a function of the dose of radiation up to the low lethal doses, where the response of the lymphocyte becomes maximal. Lymphocytes reach their minimum value in 24 to 48 hours. About 90 percent of the depression takes place in the first 18 to 24 hours, with a subsequent slower drop. With low doses of radiation, beneath the lethal range, there is a tendency for the lymphocytes to recover rapidly, and there may be a subsequent drop or oscillation in the count for a matter of days or weeks before it again becomes stabilized. With higher doses of radiation above the LD 50, there is no or at best a very slight tendency of the lymphocytes to reappear in the peripheral blood.

*The effect on the blood platelets* —With doses of radiation above LD 100 in dogs, there is a general tendency for the platelet count to increase slightly in the first 3 to 4 days after exposure. The platelets then disappear linearly for about 6 days, approaching zero around the ninth to tenth day after exposure. It is of interest that megakaryocytes are present in the bone marrow for the first 3 or 4 days in significant numbers. During the same period of time, erythroblasts, lymphoblasts, and myeloblasts have been completely destroyed, and nothing more immature than a metamyelocyte is found. With the decrease in the blood platelet count, there is a well-correlated increase in the whole-blood clotting time. The increasing clotting time that parallels the decreasing platelet count is not proof that the thrombopenia is the cause of the decreased coagulability. With lower levels of radiation,

particularly below L D 50 there are minimal changes in the platelet count (8-10).

The hemorrhagic manifestation of acute radiation injury above L.D 50 usually takes the course of a florid purpura but other hemorrhagic manifestations such as hematomata bleeding from the nose or bleeding into the gastrointestinal tract and the urinary tract without diffuse purpura are also seen. The factors that predispose to hemorrhage in the potentially fatally-irradiated person in their relative order of importance are (1) the marked thrombocytopenia with the associated clotting defect (fragile nonretractile clot) (2) ulcerations into blood vessels from the ulcers that occur in the mucosa of the mouth and gastrointestinal tract; (3) an increased capillary fragility and (4) an inconstant clotting defect at times ascribable to an anticoagulant (9-11) the nature of which is undetermined. This anticoagulant has been considered as heparin or heparinlike by Allen, et al (11) but others (9) deny its heparinlike characteristic and some deny the existence of a clotting defect or an anticoagulant (12-14). The clotting defect could be caused by a diminution in the antithrombophilic or accelerator factors. The nature of the clotting defect and means by which it can be combated are under study in many laboratories.

*The value of hematologic observations in the prognosis of radiation illness*

1. The absolute lymphocyte count is a good index of the relative exposure to radiation in the sublethal range

2. A reticulocytosis is usually but not always followed by recovery from radiation injury

3. Death usually occurs if the granulocytes fall below 1,000 per cu. mm if platelets disappear or if the clotting time is prolonged with concomitant purpura

4. Survival usually follows if the granulocytes remain above 1,500 per cu. mm

(8) Jackson D. P., Cronkite E. P. and LaRue G. V. Further studies on radiation hemorrhage. (To be published 1951)

(10) Cronkite E. P. Hemorrhagic syndrome of rats receiving radiation illness produced grossly and twice by exposure to cosmic bomb at Bikini, 1946. *Blood* 5: 32-45, Jan. 1950

(11) Allen, J. G. et al. Heparinism (?). Anticoagulant in blood of dogs with hemorrhagic tendency after total body exposure to roentgen rays. *J. Exper. Med.* 87: 71-86, Jan. 1948

(12) Rosenthal R. L. and Benedek A. L. Effects of total body X-irradiation on blood coagulation in the rabbit. II. Biological studies of radiation effects. University of California Radiation Laboratory USAEC Document UCL AECU-592, 22 Feb. 1950

(13) Holden W. O. et al. Hypochromoplastic anemia following total body irradiation. *Proc. Soc. Exper. Biol. & Med.* 70: 553-556, Mar. 1949

(14) Field, J. and Baker P. Leukemia irradiation disease and study of protective nature of the mouse. MDDC 1672 USAEC document, University of Rochester 1948

## THE DIAGNOSIS OF RADIATION INJURY

Following explosion of an atomic bomb high in the air as occurred at Hiroshima and Nagasaki there will be degrees of radiation injury varying from sublethal to supralethal. In addition, radiation injury will be combined with thermal or traumatic injuries. For purposes of administering the best care possible to survivors the diagnosis of the relative degree of radiation injury and segregation into treatment groups is essential. For purposes of triage an arbitrary division of the population exposed to atomic bomb radiation may be made into

Group 1 Survival from radiation injury is improbable (supralethal)

Group 2 Survival from radiation injury is possible (the lethal range)

Group 3 Survival from radiation injury is probable (sublethal) (15)

Attempts to segregate a population into these three groups may be based on (1) distance from the explosion, (2) personnel radiation dosimeter readings and (3) symptoms.

*Drawbacks to using distance as a basis* are (1) the amount of shielding is not known, (2) the size, yield and height of bomb are not known immediately and (3) uniform radial distribution is not assured because of terrain, buildings et cetera.

*Drawbacks to using personnel dosimeter readings as a basis* are (1) they are not yet available in large numbers (2) they are not independent of energy (3) the lethal range is not established for man and may vary from 100 to more than 600 r (4) the absolute sensitivity for any given person can not be ascertained (5) the possibility of the dosimeter being shielded or exposed is always present; and (6) some may survive 600 r whereas others may die with exposure to 200 r.

The *symptomatologic approach* is not perfect but has the following advantages: (1) the relationship of symptoms and the tempo of the illness to probable death, possible survival and probable survival are well known on the basis of Japanese data (2) the symptoms as observed in the Japanese are dependent on dose ranges rather than on a specific dose and (3) no equipment is needed except clinical observation and judgment.

By and large the simplest approach to the diagnosis of the relative degree of radiation injury is by the evaluation of symptoms. Using the symptoms as observed in the Japanese casualties the following will be observed in Group 1: vomiting within a few hours of the bombing progressing into prostration, diarrhea, anorexia, fever and early death and a profound depression in the leukocyte count within 48 hours. The mortality will be close to 100 percent.

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(15) Cronkite, E. P. Diagnosis and therapy of radiation injury. West. J. Surg. (In press 1951).



In Group 2 casualties vomiting will likewise occur on the day of bombing but will subside within a matter of hours. Following the vomiting there will be an asymptomatic latent period of from 1 to 3 weeks which will be terminated by a recrudescence of the illness associated with purpura, epilation, oral and cutaneous lesions, infections of wounds or burns that were otherwise healing well, and bloody diarrhea. The mortality of this group will be about 50 percent without treatment.

In Group 3 casualties there will be no vomiting on the day of the bombing. The late symptoms, if any develop, will be similar to those of Group 2. Without the development of late symptoms this group can be detected only by serial studies of the leukocytes. The mortality will be practically nil if uncomplicated by burns and trauma. Recent studies (16) have shown that the additive effect of sublethal amounts of radiation and sublethal thermal burns in the dog results in a very high mortality. A similar phenomenon may exist with man.

### THE THERAPY OF RADIATION

**Practical considerations.**—Group 1 casualties present no major therapeutic problem because with our current knowledge of radiation injury there is nothing that we can do to improve survival rates of persons or animals exposed to supralethal amounts of radiation. Group 3 casualties present no therapeutic problem for the immediate post-explosion period unless complicated by thermal burns or traumatic wounds. Group 3 along with Group 2 survivors will constitute the major long-term problem so far as study of the population for possible latent effects of radiation (cataracts, leukemia, cancer, and possible genetic effect of radiation in the offspring) is concerned.

The major therapeutic problem, then, is the treatment of persons in Group 2. The lethal factors in this group are infection, hemorrhage, anemia, and disturbance in the acid-base and electrolyte equilibrium. Prevention, combating, and reversal of the above four hazards constitutes therefore the therapeutic objectives in treating this group of casualties. Impaired resistance to infection exists because of the profound granulopenia and the impaired antibody production. In the granulopenic state infection may be caused by truly pathogenic organisms but generally results from the organisms that live in and on the human body in a commensal or symbiotic relation under conditions of good health. The therapeutic problems concerned with the development of the infections are both prophylactic and active.

The prophylactic phase raises some difficult problems. If antibiotics are given too soon, the organisms in the oral cavities and the gastrointestinal tract may develop a definite resistance to the antibiotic and when its effectiveness is most needed it may be impotent. There

(16) E. H. L. et al. Radiation and thermal burn injuries. Presented at National Research Council Symposium on Burns, Nov. 1950.

is no way that one can specifically designate the optimal time to start giving antibiotics. As a general rule the occurrence of ulcerations and elevated temperature the presence of burns or wounds or other clinical evidence of infection would seem to be an absolute indication for the vigorous use of antibiotics orally and parenterally. From the prophylactic standpoint antibiotics should be given orally about 7 to 10 days after exposure or when the leukocyte count is below 1 500. The antibiotics should be given until the leukocyte count exceeds 1 500. The choice of antibiotics will be determined to a certain extent by availability and the amount of nursing care that will be feasible. In the early stages it will probably be practicable only to give penicillin and aureomycin by mouth. Chloramphenicol may also be a helpful oral adjunct. Careful attention to personal hygiene care of the teeth and mouth, lips and skin will help to prevent the development of infections along with a meticulous aseptic technic in giving hypodermic injections.

*The hemorrhagic phase*—The treatment of this phase is not at all satisfactory. The causes of radiation-induced hemorrhage are fairly well understood and include (1) thrombopenia, (2) ulceration into the blood vessel (3) increased capillary fragility and (4) an inconstant blood coagulation defect sometimes with a nebulous circulating anti-coagulant. The replacement of platelets by transfusion is still impractical and unsatisfactory even under rigidly controlled laboratory conditions. Ulcerations into the blood vessels can be controlled in part by controlling the infectious ulcerations. Various drugs (rutin, vitamin P factors and various flavonones) have been considered of value in controlling the increased capillary fragility but of these none have been shown to be of value in radiation injury to date. If the blood coagulation defect were caused by heparin, it could easily be neutralized by the judicious use of protamine sulfate and toluidine blue intravenously but these agents have not controlled the hemorrhagic tendency nor increased survival time or survival rate. There is much disagreement as to whether heparin plays any role in the hemorrhagic tendency of radiation injury. Drugs for combating the first phase anticoagulants that are suspected by other investigators have not been developed.

*Treatment of the anemia*.—The causes of the anemia have been previously considered namely (1) cessation of erythrocyte production (2) increased destruction of red blood cells and (3) hemorrhage. The anemia can be satisfactorily combated by ample whole blood or washed red blood cell transfusions whichever may be available. The amounts of blood that will be necessary can be estimated. A minimum deficit of 1 percent per day for about a month, will on the average equal 50 ml of blood per day or a total of 1 500 ml. To this must be added the amount lost by hemorrhage and by increased destruction of blood. A minimum of about 5 units of blood will be needed for each radiation casualty during the first month after exposure.

*Disturbances in acid-base and electrolyte equilibrium* and their management are so well known in general clinical practice that it is not necessary to comment on them in this article.

### SUMMARY

If vomiting occurs on the day of the bombing and is followed by diarrhea prostration, continued vomiting anorexia, and fever survival is improbable and death will occur in a matter of days. If vomiting occurs on the day of the bombing and is followed by an asymptomatic period of from 1 to 3 weeks before recrudescence of the typical symptoms of radiation injury (purpura epilation ulcerations of the mucous membranes and gastrointestinal disturbances) occur survival is possible. If there is no vomiting on the day of the bombing survival is almost certain, unless there are complicating factors such as burns thermal or traumatic injuries or concomitant epidemics.

There is no simple routine for treating radiation injury. The pancytopenia temporarily induced by potentially lethal amounts of radiation is from the therapeutic standpoint essentially no different than the pancytopenia temporarily induced by drugs or infections nor is it different than the idiopathic types of pancytopenia. Under ideal conditions each person would constitute a separate therapeutic problem in which the course to be followed would be dictated by the good clinical judgment of the physician in charge following well-established therapeutic principles for the treatment of pancytopenias in general. There is no obvious reason why the temporarily-induced pancytopenia of radiation injury will not respond to treatment as well as the temporary drug-induced pancytopenia.

In due course of time general rules will be laid down by the Military Establishment the National Security Resources Board and Office of Civilian Defense proposing realistic schedules for the use of antibiotics and whole blood that will be consistent with the available stockpiles and probable future stockpiles that are being planned for times of catastrophe and that will be consistent with the procurement of blood by the National Blood Program. These schedules will be modified from time to time as preparation for atomic warfare improves.

# Basic Airborne Training

Douglas Lindsay Major MC, U S A. (1)

Thomas G Nelson First Lieutenant, MC, U S A. (1)

COMMON knowledge of airborne training is based somewhat less on current fact than on persistent legend perpetuated without malice by members of the great airborne fraternity itself. The notions that new airborne recruits bring with them to the school at Fort Benning are bewildering, humorous, and almost weird. We know because we were recently recruits there ourselves. As a factor in discouraging volunteers, perhaps just as important as the legends about airborne training, are the items that are left unsaid. The fear of the unknown and the lack of definite knowledge of what to expect at jump school is a strong deterrent to prospective applicants for airborne training.

We have heard it said often and apparently honestly. It's not the jumping I would mind, but I don't know whether I could take the 6 weeks of training at Benning. This period has been cut to 3 weeks, and has been so changed that some of the old-timers would not recognize it for the same course. It is moreover doubted that it ever was as bad as it was said to be. That there have been improvements in the technic of airborne training and in the jump technic is graphically presented by the fall in training injury rates (fig. 1). In 1942 and 1943 the injury rate was about 5 percent, and on occasion ran as high as 13 percent. Since 1948 it has been about 0.04 percent. For all practical purposes parachute jump training is no more hazardous than military training in general.

In our case, probably typical, we approached airborne training with trepidation. We knew little and feared the worst. For one of us, personal knowledge of airborne training was linked to the experience of two colleagues who entered airborne training early in World War II, both of whom suffered acromioclavicular separations. Memory of something called the parachute fracture welled up from past orthopedic instruction, and there were new stories of how harsh the instructors were and how tough their punishments. Our fears were not substantiated.

No acromioclavicular separations were observed after the school stopped teaching tumbling as a method of landing. About the same time it became evident that the parachute fracture could be attributed to

(1) Fort Monroe V

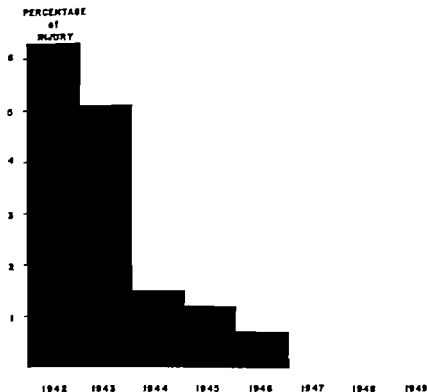


Figure 1.—Injuries in training, Basic Airborne Course The Infantry School, Fort Benning, Ga.

the technic then being taught of landing with feet about 18 inches apart. Now the feet are kept together and ankle fractures have ceased to be a typical or frequent injury. The instructors were not only capable but conscientious and courteous. It went this way: "That which you just did will cost you a few push-ups. Would you mind assuming the leaning rest position and knocking them out?" We found that the maximum punishment for infringement on or deviation from the strict rules and standards of the school was 10 push-ups, not 50 as rumored.

With the intent of encouraging more officers of the Medical Service to enter airborne training and duty the following discussion of the current basic airborne training program is presented. The need for officers of the medical branches in airborne units is definite and continuing. In view of the present military situation many officers can expect transfers from hospitals to tactical units. The officers should consider the advantages of choosing an airborne unit. Junior officers may well consider the additional pay. Career officers should certainly realize that to a large degree the future of our Army lies with airborne units and it behooves them to learn something about them.

Entering airborne training is a simple process. At present the student must be a volunteer. There are age limitations and physical standards, but these do not require that the student be in the bloom of youth or have the build of a college athlete because waivers are readily available. Our classes included captains and master sergeants approaching the fifth decade, 45-year-old majors and older senior officers. One colonel, now a brigadier general, was in the process of retirement when the Korean war broke out. He withdrew his retirement application and substituted an application for jump school. He breezed through with such ease as to be the envy of many of us who were junior to him.

On paper the physical standards for parachute training are rather rigid, but as in the case of all such standards it is the functional ability, not the anatomic abnormality, that counts. The discretion of the medical examiner is enjoined; apparently disqualifying defects must be appraised in the light of general capabilities and the requirements of duty commensurate with age, grade, and branch. The Judge Advocate in our class jumped with full dentures and neither swallowed a plate nor bruised a gum. Visual defects are no problem. The presbyopic person does beautifully. Not until his regiment is safely on the ground and a command post is set up does the colonel need to shuffle through his baggage for glasses to read a map. The hyperopic person does just as well. The myopic person does well enough. No great visual acuity is needed to get through the door, to handle a parachute in the air, or to land on a given drop zone—the last provided that the pilot is on the ball and that someone who is not myopic is jumpmastering the stick or checking the jumpmaster. For those who are really lost without glasses and cannot wait until landing to put them on, no special shatterproof goggle is required. Metal-rimmed glasses with the old-fashioned tight circling earpieces will stay on without difficulty. Glasses with the looser plastic frames are likely to come off during the exit because of the propeller blast or the opening shock, and they require a little stabilization by pieces of cellophane or adhesive tape across the bridge of the nose.

While a certain suppleness and general integrity of the trunk and its appendages is desirable, one need not be a perfect physical specimen. We have seen an officer make four jumps in a week following a lateral ligament tear which was sustained in a touch football game. He took a risk of damaging the intact extremity because of the instinctive favoring of the injured limb on landing. We do not recommend such perseverance, but he got away with it without further injury. We have seen one man jump with a known march fracture, and another during the week following a hemorrhoidectomy. He placed a pad in the appropriate place and went right ahead. Incidentally, large-sized sanitary pads were sold in the airborne area post exchange because recruit jumpers found them useful in padding the harness—over the shoulders, across the sternum, and in the adductor region of the thigh.

Besides the standards to be met on physical examination there is now required a minimum level of physical conditioning. In the short course time can no longer be given so freely to the conditioning of students after arrival at the school. If a candidate is in reasonably good physical condition he can make some 200 points on the standard physical fitness test on the first try. If he is not in reasonably good physical shape he should work out for a week or so before applying. Although we can give specific and personal evidence that it is possible to go to jump school direct from a sedentary occupation we are convinced that a little preparation is well worth while.

In a period of from 7 to 14 days depending on your build and previous condition you can prepare yourself to take the course in easy stride. The lean and hungry usually have it easier than the wider and well-fed but all can make it if they try. It will be convenient if before you arrive at jump school you are able to do 6 pull-ups (they are not stressed at school), 25 push-ups (they are greatly stressed), 40 sit-ups and 35 squat jumps. Running provides a great part of the physical conditioning of the paratrooper. There are short runs at standard double-time cadence and longer runs at the slower speed of the famous airborne shuffle. The maximum run is about  $4\frac{1}{4}$  miles made in about 50 minutes running 8 minutes and walking 2 minutes. If you can accomplish any part of the conditioning mentioned above persisting in spite of the soreness that will afflict you for the first few days it will help greatly. If you are able to do the exercises mentioned vigorously and in the numbers specified with less than 15 second rest between exercises you will as they say have it made. We strongly recommend a complete rest of 2 days before the course actually begins. Your orders will provide for your arrival at Fort Benning a few days early.

A pair of combat boots or parachute boots should be broke in while you are undergoing your preconditioning. Some cloth insignia of branch and grade should be sewed on 3 or 4 set of fatigue clothing. The metal insignia are a minor hazard in some of the training.

Other than the act per se of volunteering for airborne training no bravado is required. The parachutist is no daredevil, but a soldier who has learned to enter combat by a third dimension. Our classmates were sober home-loving, and until the night after the first jump rather quiet. To our knowledge no case of rape or mayhem was attributed to our training companions, and all assault and battery was intrasexual or academic and then usually for sufficient cause. The parachutist is better than ordinary soldier but not from different mold. In this light the results of a school survey are of interest: the student most likely to complete the course is about 5 feet 9 inches tall, college-trained with Army General Classification Test score of 110 and clerical Military Occupational Serial number

Virtually the entire 3-week course is devoted to jump training: 96 hours are so labeled. The 6 hours listed as general training are closely related, being made up of an introduction to the basic airborne course and a number of training films and instructional periods on airtal resupply and airborne assembly procedures. The 9 hours of physical training and 3 hours reserved for the troop information program are minimum Army-wide requirements in these fields.

The very few hours devoted to physical training are a distinct and recent change. Formerly a high point in the course and for many of us the greatest hurdle was the physical fitness test in the next-to-last week of the old 5- or 6-week course. Unless you passed that test you were not permitted to jump, and the physical and psychologic stress was great. Now a certain level of physical efficiency must be evidenced prior to entering jump school, and the physical training program, though intense, is routine.

The techniques taught in the 96 hours of parachute training are (1) procedure in the aircraft prior to exit, (2) technic of exit and proper body position for exit and opening shock, (3) procedure during descent, and (4) landing. The instructional sequence is not exactly parallel to this listing, and the various aspects proceed concurrently. The first introduction to parachute training is the mock-up door—a frame replica of the fuselage or rear door section of a C-82 or C-119 aircraft (fig. 2). Here the student begins an intensely repetitious but progressive series of exercises on the 7 jump commands, those commands given by the jumpmaster which control the prejump procedure in the aircraft. These commands are:

*Get ready*  
*Stand up*  
*Hook up*  
*Check your equipment*  
*Sound off for equipment check*  
*Stand in the door*  
*and*  
*Go*

Using dummy parachute equipment, all the six preliminary commands are executed in the mock-up just as in the airplane door. On the final command of *Go* the student exits from the mock-up, landing 2 to 4 feet below in a sawdust pit.

The next step in the training is the 34-foot mock-up tower (fig. 3). Here the commands of *Stand in the door* and *Go* are executed with the added features of height and a jump shock. In this mock-up the student's harness is hooked onto risers attached in turn to a trolley running on a slanting cable. On exit the student falls about 8 feet in his risers before the slack is caught up, and he then rides the trolley down.

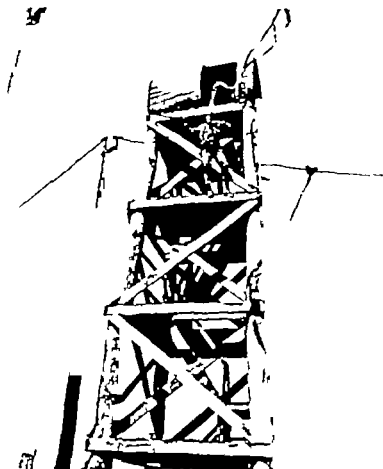




Figure 2.—A student in the mock-up door

sawdust pit. This is the phase that normally results in most of the eliminations from jump school. About 10 percent of each class drops out here either from flat frank refusal to jump or from freezing in the door. The high percentage of jump refusals at this stage and the low percentage thereafter is strong support for the feeling that fear of parachute jumping is not predicated on chance of injury but on the inherently disagreeable prospects of leaving a stable platform to fall however freely through space. The mock-up tower is not hazardous but it certainly is frightening and most jumpers will admit that a exit from it takes more intestinal fortitude than a real jump.

Another phase of preliminary training, also begun in the first week is the instruction in the technic of the parachute landing fall which is designed to transmit the shock of landing straight to the body rather than to the feet alone. The student learns by jumping from a low platform quickly to rotate and bend his body in such a way that he contacts the ground in less than a second with each of the following anatomic locations: (1) the balls of the feet; (2) the lateral aspect of the calf; (3) the lateral aspect of the thigh; (4) the gluteal region; and (5) the dorsolateral thorax and scapular region. The final result, after much



*Figure 3 —The student has just jumped from the 34-foot tower*

awkward practice is a graceful maneuver almost too quick to follow but a process which limits the shock on the feet and ankles to only 40 percent of the total load. The kids learn it from daddy when he gets home from jump school and it is something to behold to watch a 3-year-old jump from the top of the spare tire of a jeep roll over and run back for more fun.

The last technic taught in the first week is that of collapsing the parachute on landing. Because a wind of 15 miles an hour will keep the parachute inflated and drag a jumper specific instruction in the procedure of collapsing the parachute is necessary. Practical work is carried out with the aid of a wind machine (fig. 4).

In the second week the training in the mock-up the mock up tower and parachute landing falls progresses from individual performance to team performance. Eighteen-man sticks exit from the ground-bound mock up with precision speed and 4 man sticks jump from each door of the 34-foot mock-up tower. Parachute-landing fall practice progresses from a 2-foot to a 4-foot platform and falls are made with full combat equipment.

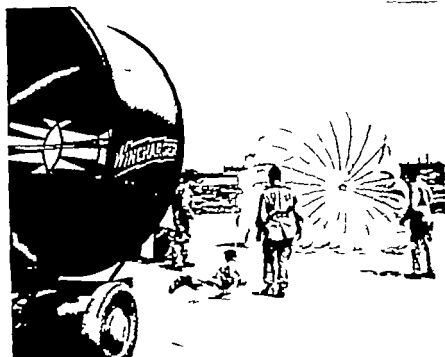


Figure 4.—Using the wind machine instruction is given in the control of the parachute after landing.

During this week two new phases are added. The first carried out in what I affectionately dubbed the Nutcracker Suite (the designation is officially taboo) is the training in suspended harness (fig. 5). Here the student learns how to control his parachute during descent, from the time of exit until landing. The other new item of the second week is the first parachute drop—from the top of the 250-foot tower (fig. 6). The student is rigged in a harness connected to a large (32 foot) specially constructed parachute and he is hauled to the top of the tower and released. Each such free descent is an instructional exercise guided by an instructor on the ground with a loud speaker coaching and correcting the student on control of his parachute and preparation for and execution of a proper landing. For most students the tower drops are sheer fun.

Finally come the last week the climax—a week of jumping (2). There is a painfully detailed fitting and checking of parachutes and then 32 men are loaded into C-82 which take off for the drop zone which has been plowed and re-plowed, by much equipment and many human feet, until it is a square mile of silt deep dust. Four minutes short of the field the red light goes on. Get ready. Your aircraft safety

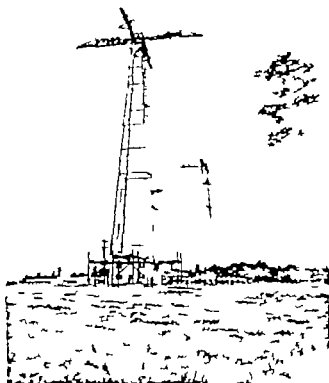
(2) Officers may afterward for an instruction fourth and fifth week of training in a transportation maneuvering, and heavy duty sector.



*Figure 3 —Control of the parachute during descent is taught in the suspended-harness apparatus.*

belt is unhooked you hunch toward the edge of your seat and arrange your static line over your left shoulder (for this jump), holding the fastener on the end in your right hand. *Stand up* You do just that, but in a certain location, with your feet arranged in a specific manner. *Hook up* You hook the snap fastener of the static line onto the quarter inch steel cable which runs the length of the fuselage just above your head. *Check your equipment* Your own equipment in front and the equipment on the back of the man ahead of you in line. *Sound off for equipment check* "Number 32 OK, down the line in reverse numerical order until there is heard Number 1 OK," then *Stand in the door* and *Go*.

The first jump is a series of individual exits. After each man takes a proper position in the door the instructor in the airplane taps him and says *Go*. Subsequent training jumps include a mass jump from the right door, a mass jump from the left door, a full mass jump using both doors, and last a full mass jump with complete field equipment including M1 rifles.



*Figure 6.—Two student making descent from 250-foot free tower to the background, 1 the foreground is controlled tower*

On the command Go you jump up and out. You pull your chin down over your sternum; grasp your reserve parachute which is perched transversely across your epigastrium, with both hands fingers spread, elbows adducted closely and you bend forward lightly at the waist. You assume this position automatically now and almost instantaneously. You begin counting on exit. One thousand, two thousand, three thousand. Unless you are counting faster than you have been taught to count, you never reach three thousand—that count is lost in the grunt of a forced expiration brought on by the opening shock. On leaving the aircraft your static line anchored by its fastener to the cable in the fuselage pays out for its 15-foot length, then pulls out your main parachute from the back pack. That chute catches the air then whom? You were going 115 knots; now you're standing still. You begin your descent. From 1 000 feet standard jumping altitude the descent takes about 50 seconds. During that time you check your canopy to see that it has opened fully and is intact. You keep a sharp lookout for other jumpers—an entanglement is a greater hazard than a bad landing. As

you approach the ground you assume the landing position. The balls of your feet touch, then the other four points of contact in quick order. You roll over to look up and see how the others are making out. You think back over the course. Some of it ~~was~~ hard work but it was worth it. Four more jumps and you will be an airborne soldier and there is nothing like it!



# Atelectasis Following Removal of Impacted Tooth

James L. E. Bock, *Major U S A. F (DC) (1)*

I Louis Hoffman *Lieutenant Colonel, U S A F (MC) (1)*

**T**HIS case is reported not only because of the rarity of massive collapse of the lung following a dental extraction under local anesthesia but also to stress the importance of efficient liaison between the medical and dental departments of a military hospital. Postoperative atelectasis or massive collapse of the lung following major operations is not an unusual occurrence. It occurs most frequently following abdominal operations performed under general anesthesia. There is however little or no mention of this condition in the dental literature.

A knowledge of the cause and the pathologic changes which occur in atelectasis is required for its early diagnosis and treatment in order to prevent the more serious complications of lung abscess, empyema, pneumonia and bronchiectasis. Atelectasis is the condition which prevails when air cannot enter the lungs to replace that which is absorbed in the alveolar capillaries. It results in the partial or complete collapse of a lobule, lobe or entire lung.

King (2) in 1933 reviewed a series of cases which he classified according to the anesthetic used and found pulmonary complications occurring in 12 percent following general anesthesia, 16 percent following spinal anesthesia and 18 percent following local anesthesia. The greater incidence following local anesthesia was attributed to the fact that the patient voluntarily because of discomfort reduces his respiratory excursions and holds his cough reflex in check. Massive collapse is not common following tonsillectomy under local anesthesia. Dwyer (3) reported a case which was complicated by peripheral neuro-

(1) Reese Air Force Base, Lubbock, Tex.

(2) King Quoted by Lee W. E., and Farrell H. L.: Massive collapse of the lung. *Lewis Practice of Surgery* Volume V W. B. Saunders Co., Inc., Hagerstown, Md., 1949. Chap. 4 p. 12.

(3) Dwyer H. V.: Peripheral neuritis complicated by massive collapse of the lung following tonsillectomy. *Arch. Int. Med.* 46: 833-840, Nov. 1930.



tis Iglauev (4) and Sawyer (5) each reported a case. In all three cases no definite cause for resection was established. Most authors believe that the primary causative factor of massive collapse of the lung is mechanical obstruction. The factors contributing to bronchial obstruction are (1) aspiration of mucus, blood and other material during and after operation; (2) increase in amount of thick mucus in respiratory tract by various antispasmodic, hypnotic and sedative drugs; (3) upper respiratory infections; and (4) reduced cough reflex.

### CASE REPORT

A 23-year-old man was admitted to the dental clinic on 8 September 1950 complaining of pain in lower left molar region which had persisted for about a week and had grown steadily worse. A dental examination revealed inflammation of the soft tissues surrounding the lower left third molar with a slight exudation of pus. The second molar was acutely sensitive to percussion. Roentgenograms revealed a complete horizontal bone impaction of the lower left third molar impinging on the distal root of the second molar and involving the root canal. The patient was admitted to the hospital to clear up the infection and for an oral operation. He had had pneumonia of the left lung in 1944 without complications or sequelae.

He was given 300,000 units of procaine penicillin in oil intramuscularly daily and capsule containing aspirin, phenacetin, caffeine and codeine (0.03 gram) every 4 hours as needed for pain. The infected area was irrigated every hour with warm saline solutions. The patient was observed daily and on 11 September the infection had subsided sufficiently to warrant the removal of the impacted tooth. The preoperative medication consisted of 0.1 gram of pentobarbital sodium, 15 mg of morphine sulfate and 0.5 mg of tropine sulfate. The patient was operated on on 11 September at 1430 hours under mandibular block using 2 percent procaine hydrochloride. A surgical flap was laid back and the horizontal impaction and second molar were removed. At 2000 hours moderate oozing from the wound was noted. A hemopack was applied to the wound and 100 mg each of vitamins C and K were given parenterally. At 2300 hours when the patient was seen by one of us the oozing had practically ceased. The patient slept soundly for the remainder of the night.

At 0800 hours the following morning he complained of chest pain, tightness and dyspnea. He was unable to sit up, felt weak, was frightened and perspired profusely. A diagnosis of massive collapse of the major portion of the left lung was made immediately. The hemopack was

(4) Iglauev, S.: Massive pulmonary collapse following tonsillectomy under local anesthesia. Report. *T. Am. Laryng. Rhin. & Otol. Soc.* 42: 27-34, 1936; also, *Pulmonary collapse following tonsillectomy under local anesthesia*, report of case. *Arch. Otolaryng.* 25: 382-383, Apr. 1937.

(5) Sawyer, L. L.: Massive atelectasis following tonsillectomy under local anesthesia. Report of case. *Arch. Otolaryng.* 46: 45-51, July 1947.

removed and a roentgenogram of the chest was ordered. Meanwhile respiratory distress increased the patient was placed in an oxygen tent and postural drainage was instituted. The roentgenogram confirmed massive collapse of lower two-thirds of the left lung with the heart, trachea and mediastinum displaced to the left. The respiration was rapid and labored, the pulse was rapid and thready and the temperature was  $101^{\circ}$  F. The patient was moderately cyanotic. His condition was critical. Arrangements were immediately made for a bronchoscopy. A suppository containing 0.2 gram of monosodium barbitalurate and 1 gram of aureomycin were given prior to bronchoscopy. A large amount of thick mucopurulent secretion and some blood clots were aspirated. When the aspiration was half completed the left lung could be seen to begin to expand. On completion of the bronchoscopy the patient felt better and was able to sit up. A postbronchoscopic roentgenogram revealed almost complete aeration of the left lung with a return to normal position of the trachea, heart and mediastinum. The left diaphragm was still higher than the right.

The patient was replaced in the oxygen tent. Cough and postural drainage 10 minutes out of every hour was encouraged. A total of 4 grams of aureomycin and 900,000 units of procaine penicillin were given daily. The patient was removed from the oxygen tent after 4 hours. On 13 September he was comfortable. The temperature, pulse and respiration were normal. A roentgenogram of the chest taken on 14 September showed complete aeration of left lung. The left diaphragm was still elevated. There were no signs of pneumonia. Aureomycin and penicillin were continued until 18 September and a final roentgenogram of the chest was taken which showed no significant abnormalities. The patient was discharged to light duty on 21 September and resumed his regular duties 1 week later.

### DISCUSSION

Reviewing the causative factors of pulmonary collapse one would hardly expect such a complication following a relatively simple dental extraction under local anesthesia. This patient had no apparent allergy. The premedication with morphine, atrophine and pentobarbital sodium was considered optimal. During the surgical removal of the teeth the patient seemed to be uncomfortable and a little anxious. The extractions were performed with the patient sitting. For complicated impactions patients are usually operated on in a horizontal position with the head down but this was not considered a difficult case and the extractions were performed easily.

According to Jernam (6) and other writers atelectasis occurs usually from 24 to 72 hours postoperatively. The onset in this case occurred about 14 hours after operation. The patient received only one capsule for pain a few hours after the extractions were performed. An aspirator was used throughout the operation and adequate suction was

(6) Jernam, W. M. Diseases of the Lung. In Tice, F.: Practice of Medicine. Vol. 1. V. F. Prior Co., Inc., Hagerstown Md., 1949, p. 363.

obtained. At no time was the gag and swallowing reflex abolished. The amount of postoperative bleeding was slight. The cause of relectasis in this case was the aspiration of blood and mucus as shown by the bronchoscopy. Because the cough and gag reflex was not abolished during the operation, and because efficient suction was maintained throughout, it is felt that the aspiration did not take place at that time but because there may have been slight oozing of blood from the wound while the patient was sleeping soundly. It is believed that the aspiration took place then. It is possible that fear, apprehension and discomfort may have restricted the gag and cough reflex during the operation. Also, the upright position of the patient would influence the gravitation of blood and mucus to the region of the larynx.

### CONCLUSIONS

This case illustrates that serious complications can arise from a comparatively simple dental operative procedure. Massive collapse of the lung is relatively uncommon as a postoperative complication but must be considered in the practice of dentistry. The following measures are suggested in the hope of preventing such an occurrence:

1. Avoid any dental extractions or oral operations if there is any evidence of local oral sepsis or upper respiratory infection.

2. Aoid overusage of premedication and postoperative medication with drugs which tend to depress the cough or gag reflex thereby hindering the patient from expectorating mucus, blood and/or other material.

3. Give sufficient premedication to relax the patient so that fear and discomfort will be markedly lessened.

4. Obtain a complete blood count including bleeding and clotting time preoperatively.

5. The operator should strive for as complete hemostasis as possible and the patient should be seen frequently if there is oozing.

6. Excessive sedation and hypnosis should be avoided if oozing is present.

7. Encourage cough and postural drainage at specified times following oral operations in which the patient has been heavily premedicated.

8. Perform extensive oral operations with the patient in a horizontal position with the head down in order to prevent mucus and blood from gravitating into the lungs.

9. Maintain the patient in a prone position with the head lower than the body for from 12 to 24 hours following operation to promote drainage from the mouth.

10. Encourage early ambulation.

11. Use adequate suction continuously during all oral operations.

12. Use chemotherapy both preoperatively and postoperatively if there is any evidence of recent dental or upper respiratory infection.

When symptoms of atelectasis or the suspicion thereof arise following a dental operation, consultation with a physician should be had immediately. If possible bronchoscopic suction of the aspirated material from the bronchi should be performed without delay in order to relieve the symptoms and prevent serious complications.



# Focal Attack in Tuberculosis Control

Sidney A. Britten, *Commander MC, U S N* (1)

Wilbur V. Charter *DPH* (2)

THE purpose of this study is to review and analyze the morbidity data relating to tuberculosis among naval personnel in order to see if guides are available for the planning of supplementary aids to the more general preventive measures now in effect. Although the Navy has a rigidly controlled population it is difficult specifically to measure the hazard of that population with respect to tuberculosis. In the first place naval personnel have many contacts with civilians as well as working relationships with individuals in the service. Furthermore many continue living with the family unit while others are separated entirely from a household environment. Another variable difficult to evaluate is the problem of measuring the effect exerted by turn-over of personnel. Recently it has been shown that from 85 to 90 percent of the recruits react negatively to an intradermal test with 0.0001 mg. of purified protein derivative of tuberculin (3). This is a higher percentage than is found for other naval personnel. It is probable therefore that the current increase in strength will result in an increase in the ratio of those having negative tuberculin tests.

Smiley and Raskin (4) in their review of tuberculosis in the Navy pointed out the consistent decline in the incidence of tuberculosis since 1900 and envisaged the time when this condition would be entirely eradicated. The forces exerted by the wartime mobilization however interrupted the favorable decline in rates. Today it would appear that the standard of perfection predicted by them will not be reached in the foreseeable future.

The Navy carefully screens all applicants and maintains constant vigilance for early symptoms and signs of illness. In addition de-

(1) Preventive Medicine Division, Bureau of Medicine and Surgery, Department of the Navy.

(2) Medical Statistics Division, Bureau of Medicine and Surgery, Department of the Navy.

(3) Canada, R. O. and B. L. R. W. Tuberculosis: Statistics of morbidity and mortality of Navy and Marine Corps. U. S. Armed Forces M. J. 1: 971-978, Sept. 1950.

(4) Smiley, D. F. and Raskin, H. A. Tuberculosis: Navy problem. Dis. of Chest 10: 210-235 May-June 1944.

tailed programs of sanitation and hygiene, careful examination and supervision of contracts, and annual roentgenographic examinations are all basic elements of the general preventive program. In spite of all these safeguards, however, the crowding of personnel aboard combat vessels together with assignments to certain foreign areas introduces additional risks to naval personnel. In spite of all possible preventive measures it appears that certain factors will continue and tuberculosis will remain a problem in the Navy that will demand constant vigilance on the part of the Medical Department.

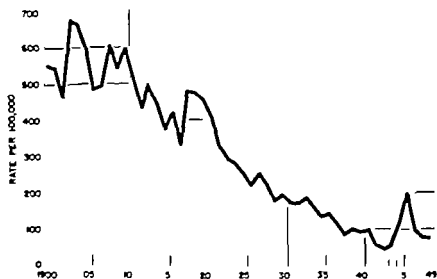


Fig. 1—Original death rates for tuberculosis, all forms, U. S. Navy 1900-1949

In compiling morbidity statistics in the Navy the basic consideration is the incidence of a condition and not the number of persons involved. Individuals on the sick list are carried under only one diagnosis at a time—the one which the attending medical officer considers to be the major cause for hospitalization. A change in diagnosis is reported when, in the opinion of the medical officer, another diagnosis warrants recording. Although this system quite accurately records incidence of any condition with the related sick days it will show a difference between incidence and number of persons because any one person might be changed from one tuberculosis diagnosis to another during any year. This procedure is especially important in tuberculosis reporting because changes of activity as well as changes in extent (minimal, moderately advanced, and far advanced) would be recorded as other incidents of tuberculosis. With the exception of figure 1, all data presented in this article are based on incidence which may be considered at from 20 to 25 percent greater than the actual number of persons involved.

The rates for tuberculosis all forms continued to decline through the year 1944. The incidence rate was slightly over 1 per 1 000 in 1943 and then receded in 1944 to 0.8 per 1 000. This is the lowest rate ever recorded for naval personnel. In 1945 the incidence rate was twice that for 1944 and increased again in 1946 during demobilization to 3 per 1 000 average strength. Subsequently the rate decreased rapidly and by 1948 had again reached a level comparable to that of 1943 (table 1). Many variables influence the forces of morbidity in controlled populations and these factors become of paramount importance when attempting to analyze tuberculosis rates. Because this disease is insidious in character the annual rates are greatly influenced by the case-finding programs in use during the period under consideration. For instance the routine chest x-ray case-finding program had a marked effect in producing changes during the years included in this study. From 1941 to the middle of 1944 routine roentgenograms or photofluorograms of the chest were made only of recruits and reserve personnel as they came on active duty (5, 6). After June 1944 however the chest x-ray program was gradually expanded to include a chest roentgenogram or photofluorogram of all personnel as part of the physical examination made when entering service at annual intervals while on active service when practicable and as part of the physical examination made during separation from the service. This intensified program tended to produce higher rates among recruits in the period prior to June 1944 and among all personnel subsequent to that time at least until the Navy had undergone as complete a screening as was approached during demobilization.

TABLE 1.—Incidence and incidence rates for tuberculosis all forms U S Navy 1943-1948

Year	Incidence	Incidence rate per 1 000
1943	2 489	1.2
1944	2 662	0.8
1945	5 832	1.6
1946	4 016	3.0
1947	1 061	1.8
1948	566	1.1

When the incidence rates are inspected separately for men and women some apparent differences appear that need closer examination (table 2). Although the rates for women were consistently higher than those for men, a reduction in the number of cases in women would have had little effect on the incidence of tuberculosis in the Navy as a whole. Nevertheless it seems pertinent to attempt to pinpoint the

(5) B. H. Cress, C. F. and Britten, S. A. Five years of photofluorography in the Navy. U S Na M Bull 45: 1203-1207 Dec 1945.

(6) Shapiro R. Pulmonary tuberculosis in Navy recruits: review of 50 100 photofluorographic chest examinations. Am Rev Tuberc. 49: 485-489 Jun 1944.



TABLE 2.—Incidence and incidence rate by sex for tuberculosis, all forms U. S. Navy 1943-1948

Year	Incidence		Incidence rate per 1 000	
	Men	Women	Men	Women
1943	2 354	148	1.1	4.3
1944	2 517	142	0.8	1.6
1945	3 699	159	1.6	1.3
1946	3 823	124	3.0	4.4
1947	1 058	20	1.8	3.3
1948	549	14	1.1	3.2

problem more closely within each sex group. Among the men there appears to be only slight differences between the officers, Navy enlisted, and enlisted personnel of the Marine Corps. Of the three groups the lowest rates were recorded for the Marine Corps enlisted group and the highest for enlisted personnel of the Navy with the officers between the two (table 3). The reasons for these consistent differences even though small in magnitude are difficult to explain.

TABLE 3.—Incidence and incidence rates by type of male personnel for tuberculosis, all forms U. S. Navy 1943-1948

Year	Incidence			Incidence rate per 1 000		
	Enlisted personnel			Enlisted personnel		
	Officers	Navy	Marine Corps	Officers	Navy	Marine Corps
1943	197	1 851	286	0.8	1.2	1.0
1944	259	2,040	218	0.8	0.8	0.5
1945	615	4,604	474	1.7	1.6	1.2
1946	458	3 810	439	2.9	3.0	2.9
1947	86	846	106	1.5	2.0	1.2
1948	45	464	40	0.9	1.2	0.5

Among the women one of the significant findings even though some variation was expected, was the higher rates noted for the Nurse Corps. Caution should be taken in interpreting these rates however because such small numbers are involved and one or two cases in any one year will greatly influence the rates. During the period under discussion the rates for the Nurse Corps were consistently higher than for either the enlisted group or the other officers (table 4). It is of special interest that the rate for nurses was higher than for the other female officers because the two groups probably were fairly comparable in age and pre-nurse-training environmental background. The female enlisted group had rates that were higher than the rates for enlisted men. This was true even though there were practically no female personnel more than 40 years of age. This is an important consideration.

tion because tuberculosis rates in the Navy increased with age as shown in figure 2

TABLE 4—Incidence and incidence rates by type of female personnel for tuberculosis all forms U S Navy 1943-1948

Year	Incidence			Incidence rate per 1,000		
	Officers	Nurses	Enlisted personnel	Officers	Nurses	Enlisted personnel
1943	1	10	137	0.2	1.9	5.7
1944	9	16	117	1.0	1.9	1.6
1945	11	35	92	1.2	3.5	1.1
1946	9	35	80	2.8	6.5	4.0
1947	—	9	11	0	4.3	3.8
1948	2	8	4	4.2	4.0	2.1

After reviewing the age specific rates the question arises as to whether the increase in the rates was related only to age or whether the rates were affected by the continued exposure to environmental factors related to naval service. The period being considered in this report was a very abnormal interval for the two variables age and length of service. Large numbers of older persons were suddenly brought into the service and the impact of this group on the tuberculosis rates is difficult to ascertain. As an example nearly 20 percent of the incidence of tuberculosis for the years 1945 to 1948 was contributed by persons over 24 years of age with less than 3 years

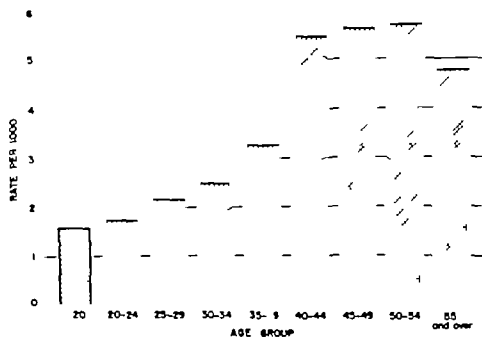


Figure 2.—Incidence rates by age group for tuberculosis all forms, U S Navy 1943-1948

service. Unfortunately population bases for the entire period are not available for age broken down by length of service.

TABLE 5.—Incidence and incidence rate by specified type of enlisted personnel for tuberculosis, all forms U. S. Navy 1943-1948 combined

Type of personnel	Incidence	Incidence rate per 1,000
Marine Corps enlisted	1,523	1.1
Navy enlisted		
Aviation	771	1.2
Sailor	5,477	1.2
Artificers	3,343	1.7
Hospital corpsmen	714	2.2
All other	2,024	2.1

Includes specialists which in civil life would be known as crafts or trades, such as painters, carpenters, machinists, etc.

In attempting to pinpoint as closely as possible the focal point of tuberculosis in the Navy it seemed advisable to attempt to separate the Navy enlisted into categories according to specialist ratings. As was mentioned previously Marine Corps personnel have lower rates than the Navy enlisted group as shown in table 5. In fact the rates are lower than for any of the specialty groups of the Navy. Of the specialty groups the highest rates were noted for artificers and hospital corpsmen. Although the rate for the "all other" classification is the second highest, this group is so heterogeneous in composition that little direct information is gained from the comparison. In the case of hospital corpsmen there is no knowledge available as to the number of them contracting tuberculosis who had been exposed through direct contact with patients. Another bit of missing information relating to artificers and hospital corpsmen is an age breakdown of the individuals included in these two groups. Because age is an important factor it is possible that this variable exerted some influence on the observed rates. Further study relating to tuberculosis especially among hospital corpsmen, is indicated.

TABLE 6.—Incidence by activity classification for tuberculosis, all forms U. S. Navy 1943-1948 combined

Diagnosis classification	Incidence	Percent of total
Tuberculosis all forms	16,627	100
Pulmonary chronic, cure	8,797	53
Pulmonary chronic arrested	5,764	35
All other	2,066	12

Includes extrapulmonary, primary, pneumonic, tracheobronchial, pleuritic, and pulmonary not otherwise classified for the entire period. 657 cases of tuberculosis primary previously healed, during the years 1945-48 combined.

By diagnosis.—For the period 1943 through 1948 the incidence was subdivided by classification of combined diagnoses as shown in table 6. Active chronic pulmonary tuberculosis accounted for 53 per cent of the total. About three-quarters of the patients classified as all other had active tuberculosis, the remainder having pulmonary calcifications.

In considering pulmonary tuberculosis separately, data for the combined years 1945 through 1948 only are included. A change in the nomenclature in 1945 broke the individual diagnostic continuity; therefore pulmonary tuberculosis is considered separately for the period 1945 through 1948 as shown in table 7. Fifty-nine percent of the total incidence was active and 35 percent arrested. The effect of x-ray case finding is clearly evident. It is probable that most of the minimal cases were discovered by routine roentgenograms of the chest. At admission, 46 percent were minimal in extent, a proportion reflected in mass x-ray surveys of the general population, but when clinical study was completed, the clinically significant proportion had been reduced to 19 percent of the total. Because many persons were returned to duty after clinical study with such diagnoses as arrested minimal tuberculosis (without bacteriologic confirmation or evidence of prior active disease) or pulmonary infiltration, cause undetermined, the responsibility for the continued supervision of their future health is a heavy one.

TABLE 7.—Incidence of pulmonary tuberculosis  
U. S. Navy 1945-1948 combined

Diagnosis	Incidence	Percent of total
Total	10,910	100
Pulmonary primary active	181	2
Pulmonary primary apparently healed	657	6
Pulmonary reinfection, active, minimal	2,063	19
Pulmonary reinfection, active moderately advanced	2,983	27
Pulmonary reinfection, active far advanced	1,190	11
Pulmonary reinfection, arrested, minimal	2,994	27
Pulmonary reinfection, arrested, moderately advanced	785	7
Pulmonary reinfection, arrested, far advanced	57	1

### SUMMARY

The incidence rates for the period under study represent an interruption of the downward trend for tuberculosis, all forms, since 1900. The interruption came during a period of war and is not unexpected in view of the increase in tuberculosis mortality and morbidity reported by others for this country and elsewhere (7-9). Complicating

(7) Edwards, H. R., and Drolet, G. J.: Implications of changing morbidity and mortality rates from tuberculosis. *Am. Rev. Tuberc.* 61: 39-50, Jan. 1950.

(8) Sartwell, P. E., McEley, C. H., and Long, E. R.: Tuberculosis in German population, United States Zone of Germany. *Am. Rev. Tuberc.* 59: 481-493, May 1949.

(9) McDougall, J. B.: Tuberculosis in England During the War. *Am. Rev. Tuberc.* 46: 77-683, Dec. 1944.

the interpretation of this phenomenon is the added factor of routine mass roentgenographic examinations of the chest which were begun in 1941 and reached maximum efficiency in 1945. That the interruption in the downward trend is temporary may be suspected by the rapidity with which the trend line has approached the prewar level. It is too early as yet, to determine what effect if any the x-ray case-finding program may have on accelerating the downward trend in incidence rates.

That marked differences in incidence according to age, sex, occupation, and length of service were evident during the period of study has been clearly shown. Women had higher rates than men. Nurses had the highest rates of all. Rates generally increase with increasing age and this fact may be expected to cause a rise in incidence rates in the early years of service during periods of mobilization when men of the older age groups are accepted for enlistment in large numbers.

Minimal shadows in the chest roentgenogram appear to be important (10-12). More than one-half of the persons referred for clinical study of such shadows were found to have arrested lesions of tuberculosis or pulmonary fibrosis of undetermined cause. Assuming that a large proportion of them are returned to duty, a potential reservoir of pulmonary disease is created.

The use of incidence relating to tuberculosis, although providing important information, results in a certain amount of bias when compared to the number of persons involved. The course of tuberculosis and the changes in diagnosis due to activity, extent of involvement, or complications make the incidence rates higher than would be the case if patients rather than diagnoses were recorded.

### CONCLUSIONS

The incidence rates for tuberculosis, all forms and its subdivisions have proved to be useful in exposing certain differences in respect to sex, age, occupation, and length of service which indicate that the distribution of cases of tuberculosis has not been random among naval personnel during the period 1943 through 1948. These differences should be explored in order to define, if possible, the sources of dissemination of the tubercle bacillus and the causes of reduction in host resistance to invasion. This is important in view of the high proportion of recruits entering service without evidence of prior infection.

(10) Silverman, C. Appraisal of contribution of mass radiography to discovery of pulmonary tuberculosis. *Am. Rev. Tuberc.* 60: 466-481, Oct. 1949.

(11) Fellows, H. H., Evans, J. A., and Stephens, M. G. Disposition and follow-up of pulmonary tuberculosis: study based on character and extent of lesion seen on initial roentgenogram. *Am. Rev. Tuberc.* 60: 487-500, Oct. 1949.

(12) Reiser, D., and Downes, J. Minimal tuberculous lesions of lung: their clinical significance. *Am. Rev. Tuberc.* 51: 393-412, May 1945.

The differences suggest further investigation to find answers to such questions as (1) Where did personnel admitted for tuberculosis acquire the infection; were they infected prior to entering the service or did they acquire the infection after entering the service? (2) What personnel in the groups characterized as artificer hospital corpsmen, and all other account for the higher incidence rates within those groups? (3) Is the high rate among nurses caused by infection acquired during training or during the performance of their naval duties? Because it appears unlikely that these questions may be answered by analyses of rates a study of the individual case records of persons admitted for tuberculosis has been initiated.

A particular point of immediate interest emerging from this investigation is that attack rates increase with advancing age. Persons over 30 years old must be included in all x-ray surveys and those with productive cough examined promptly lest they become the unsuspecting disseminators of the tubercle bacillus among the younger men in their charge 90 percent of whom when recruited react negatively to a tuberculin test. In addition, particular attention to the possibility of tuberculosis should be paid in examination of older personnel entering active naval service in time of mobilization.

Another important point which must be kept constantly in mind is the necessity for continuous supervision of naval personnel with pulmonary defects causes of which have not been determined.



# Repair of Antro-Oral Fistula

## Report of Case

Richard J Burch, *Lieutenant Colonel U S A. F (DC) (1)*

ON 26 November 1949 a 22-year-old soldier was admitted to the oral surgery service of Percy Jones Army Hospital from overseas with the transfer diagnosis of antro-oral fistula of the right maxilla. In March 1949 his right maxillary first molar had been removed with difficulty. Following this procedure the opening into the sinus at the site of the removed molar failed to close. Four unsuccessful attempts to close the fistulous opening surgically were made between March and November. The patient had suffered from moderately severe headaches and a sensation of fullness of the right side of the face. He was unable to play the trumpet in the band which was his military duty.

Examination revealed a well-developed well-nourished man with a chronic right maxillary antro-oral fistula (fig 1) discharging a foul exudate. The tract occupied the area of the first molar socket. The opening into the maxillary sinus had a diameter of about 1 cm. Chronic inflammation of the regional soft tissue and sequestration and necrosis of the bone were observed. Complete roentgenographic examination revealed a clouding of the right maxillary sinus (fig 2) and no evidence of a foreign body within the sinus. There was a marked difference in the transillumination of the right and left maxillary sinuses.

The sinus was irrigated daily with normal saline solution through the fistulous opening and the tract was curetted under local anesthesia to remove the sequestrums. A full maxillary impression and model were made. The model was relieved to provide for postoperative swelling in the area of the contemplated operation and duplicated. A full palatal acrylic splint with retention clasps (fig 3) was then constructed on this model and inserted to maintain an iodoform gauze dressing in the tract to close communication between the maxillary sinus and the mouth. Daily irrigations were continued followed by the installation of 200 000 units of penicillin in 5 cc. of normal saline solution and dressing. After 10 days the headaches

(1) Chasent Air Force Base Ill.





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Figure 1.—A forward /middle /view of dental procedure. Figure 2.—Close-up view of dental procedure of the mandible /area.



Figure 3.—Full palatal acrylic splint. Figure 4.—Representation on model of operative procedure. Figure 5.—Representation on model of operative procedure. Figure 6.—Wound almost completely healed.

stopped and the appearance of the tissues of the tract improved. Irrigation penicillin instillation into the sinus and dressing were repeated 3 times a week for 4 weeks. The patient was then considered ready for operation.

On 24 January 1950 a Caldwell-Luc radical antrostomy nasal antrostomy and plastic closure of the fistula by turning a palatal flap were performed under gas-oxygen-ether left nasal intratracheal anesthesia. A low laryngeal pack was placed around the Magill tube with 20 inches of 2 inch damp gauze by means of a Magill forceps. Following routine draping a small rubber catheter was then passed through the right nares into the oropharynx and brought out through the mouth. A No. 8 silk ligature fastened at one end around a small synthetic sponge was then fixed to the catheter and the silk returned through the mouth and nares and the sponge

pulled into the right nasopharynx to block the opening and control hemorrhage. The silk control ligature was fixed to the draping. The oropharynx was further packed from the mouth with gauze sponges. An elliptical incision was begun in the mucobuccal fold distal to the second molar, carried downward and anteriorly along the gingival margin to course upward into the mucobuccal fold anterior to the cuspid. Entry into the maxillary sinus through the canine fossa was made with mallet and chisel and enlarged with rongeurs (fig. 4). The sinus was filled with polypoid tissue which was completely removed and a portion sent to the laboratory for pathologic examination. A nasal opening into the sinus was made by passing a curved Kelly forceps through the right nares and pushing it forcefully through the antro-nasal wall below the inferior concha. This opening was enlarged with the rongeurs through the canine fossa window. Hemorrhage from the sinus was controlled with hydrogen peroxide packs.

All tissue was removed from the fistulous tract; the antral and oral origins of the tract and the bone were lightly curetted. The palatal flap was incised leaving a proximal pedicle and the flap including the periosteum elevated. All epithelium was removed from the distal end of the flap for 1 cm. (fig. 5). The flap was then turned into position to close the defect and the denuded end tucked under the buccal flap and secured with a mattress suture of 000 silk. The buccal flap was then sutured and additional sutures placed on the palatal surface for maintenance of the transposed tissue. The donor site on the palate was dressed separately with gauze saturated in petrolatum and iodoform. The area over the repair was likewise dressed and the acrylic splint placed. The nares and throat were inspected and suction was applied. The postnasal pack was removed and replaced by small gauze nasal dressing pulled into position from the throat and the ends of the control silk ligature passed out of the nares to be fixed to the cheek with tape. The laryngeal pack was then removed and suction was applied to the larynx. The Magill tube was removed and the patient was taken to the recovery room.

The patient withstood the operation well and his blood loss was minimal. Routine postoperative care including penicillin therapy was given. The maxillary sinus was irrigated with 50 cc. of warm saline solution through the nasal opening on the second postoperative day and twice weekly thereafter for 2 weeks. On the fifth day the dressing splint and suture were removed and the area redressed. The dressing in the donor site was not disturbed until 10 February and at that time the area was almost entirely covered with fibroid tissue epithelializing at the periphery (fig. 6). With the healing of the donor area 2 weeks later the patient was discharged.

**Comment.**—In the management of this problem in oral surgery the following points are emphasized: (1) light pressure on the tissue used to close an antro-oral fistula is desirable; (2) failure of closure of a antro-

oral fistula is largely caused by inadequate preparation and secondary chronic sinusitis and (3) when secondary chronic sinusitis is present closure is exceedingly difficult in the absence of radical antrostomy at the time of attempted closure and intranasal antrostomy for postoperative irrigation and drainage of the maxillary sinus



# The Treatment of Urinary Tract Infection

James C. Kimbrough *Colonel, AIC, U S A. (1)*

**I**NFECTION is the most common disease condition of the urinary tract. For the purpose of treatment it is convenient to consider these infections in two classes: acute and chronic. The acute manifestations are acute pyelonephritis, cystitis, prostatitis and vesiculitis. (Perinephric infections, gonorrhea, nonspecific urethritis and tuberculosis of the genitourinary tract require extensive individual discussion and will not be considered in this article.) Chronic infections include chronic pyelonephritis, infected hydronephrosis, pyonephrosis, chronic cystitis, prostatovesiculitis and urethritis. Infection is rarely confined to the bladder more than a few days and soon extends to the kidneys. The diagnosis of pyelitis is obsolete as a disease entity because the renal tubules are rapidly invaded and this diagnosis has been replaced by the term pyelonephritis.

## ACUTE INFECTIONS

Pyelonephritis and cystitis (pyelocystitis) is the commonest type of acute urinary tract infection. This disease is manifested by frequent, urgent and painful urination, chills, fever, and lumbar pain, gross hematuria may be present. It is often necessary to relieve the symptoms before the results of the urologic examination are ascertained.

### *Method of management*

1. Rest in bed.
2. Catheterization of the bladder for specimen for microscopic examination and culture. Much information is gained early by making gram stains from centrifuged specimen.
3. Excretory urogram.
4. General medication for relief of symptoms.

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(1) Walter Reed Army Hospital, Washington, D. C.

3. Specific medication consisting of 1 gram of sulfadiazine every 6 hours the first day and 0.5 gram every 6 hours after the first day; 300,000 units of an aqueous solution of penicillin every 6 hours the first day followed by 300,000 units of procaine penicillin daily. Usually less than 5 days of this therapy will relieve the acute symptoms. Combinations of the sulfonamides may be of greater value than a single drug therapy. The urine should be alkalinized when sulfonamides are given, in order to minimize the risk of renal damage. Chloramphenicol, aureomycin, and terramycin give excellent therapeutic results but it is considered sound therapy to begin with the sulfonamides and penicillin and reserve the other agents until the causative organism is ascertained. It is not necessary to use the expensive antibiotics for cases in which the less expensive drugs give equally satisfactory relief.

Adequate fluid intake should be maintained. It is desirable to give 3,000 cc. daily orally or parenterally. This will establish an output of about 1,200 cc. of urine unless there is excessive fluid loss by vomiting or perspiration. It has been advised that the fluid intake be limited when urinary antiseptics are administered in order to increase the urinary concentration of the active agent. It is believed, however, that the generally beneficial effect of a high fluid intake and the lavage effect on the urinary tract more than balance the decreased concentration of the antiseptics. In treating urinary tract infections adequate drainage is of paramount importance. The protective forces of nature may be a more powerful aid to recovery than the therapeutic effects of drugs and antibiotics.

### CHRONIC INFECTIONS

With the exception of tuberculosis the normal urinary tract does not harbor infection for a long period. Recurrence or chronicity is usually caused by obstruction, calculus or endocervicitis. It is imperative that complete urologic examination be made in every case of chronic or recurrent infection and the necessary procedures—surgical or otherwise—be performed to correct obstructions, to remove calculi, or to eliminate other associated and contributing pathologic conditions. Infection is difficult to eradicate in the presence of urinary stasis and even if cleared the relief is only temporary and recurrence takes place. Chronic infections may follow acute attacks or the onset may be insidious and the disease process noted only after much damage has been done. Urinary antiseptics administered orally or parenterally become effective by urinary excretion and will have little effect in the presence of severe renal damage.

#### *Procedures in treatment of chronic infections*

1. Complete general and urologic examination, including a search for foci of infection.
2. Repeated urine cultures to ascertain the type and sensitivity of the infective agent. Not infrequently more than one organism is present.

### 3 Adequate general care and proper fluid intake

4 Selection of the specific therapeutic agent for the bacteria present. Test the causative organism for sensitivity to the therapeutic agents available and make the proper selection. Bacteria become resistant to some drugs and antibiotics in a short time therefore it is necessary to make frequent sensitivity tests and change the therapeutic agent as indicated.

5 Correct associated pathologic conditions such as obstruction of the ureters, calculi or endocervicitis.

*Bacteria present.*—*Escherichia coli* is the most frequent invader and the least difficult to eradicate. *Staphylococcus aureus* is next in frequency. *Aerobacter aerogenes* probably takes third place and *Pseudomonas* and *Proteus* occupy fourth and fifth places. *Streptococcus hemolyticus* occurs rarely. Diphtheroids, *Micrococcus tetragenus* and *Str. faecalis* are frequently found mixed with the other bacteria. *Pseudomonas* and *Proteus* often occur when patients have calculi or in patients with drainage tubes. They are urea splitters and difficult to destroy. *Staph. aureus* may be a urea splitter and resistant to treatment.

## THERAPEUTIC AGENTS

*Sulfonamides* are the most frequent agents used in combating urinary tract infection. They are nephrotoxic, causing tubular damage and urinary obstruction if the crystals block the tubules and ureters. Their administration should be accompanied by adequate fluid intake and alkalization of the urine. There are a few cases of allergic reaction causing lower nephron nephrosis. At this hospital since the beginning of this therapy no serious consequences have been observed in patients treated in the hospital. This record has been maintained because alkalization and fluid intake have been emphasized. Sulfadiazine is a safe agent. It is slowly absorbed and gives good urinary concentration. It is claimed to be dangerous because of its nephrotoxic reaction. Sulfathiazole is rapidly absorbed and gives excellent urinary concentration but is associated with gastrointestinal reactions.

Splendid results have been claimed for combinations of the sulfonamides—sulfathiazole, sulfadiazine, sulfamerazine, sulfisoxazole and sulfacetamide. It is claimed that they have a synergistic action but this has not been proved definitely and their action may be a mere summation of effect. The sulfonamides are effective in treating almost all forms of urinary tract infection, but have some disadvantages. It may be that they cause tubular damage late after their use. It is advisable to limit the administration to from 10 to 14 days and to make sure of alkalization and adequate fluid intake. Sulfonamides have been relegated to the background by the new wonder drugs but are still safe and economical agents in the treatment of urinary tract infection. A few cent. worth of sulfonamides may accomplish results equal to those obtained with several dollars worth of antibiotics. The dosage is 0.5



to 1 gram every 6 hours depending on the severity of the symptoms and the stage of the disease. Daily estimation of blood levels is requested only in special cases. Bacteria do not acquire early resistance to sulfonamides, which is an advantage over the rapid resistance trained in the case of antibiotics.

Pulaski has combined sulfadiazine, penicillin and streptomycin for intravenous use with what appears to be a synergistic effect far beyond the supplementary action.

**Antibiotics.**—Penicillin is the most effective antibiotic in treating staphylococcus and streptococcus infections of the genitourinary tract. It is not effective against the most common invader *E. coli*, but combined with sulfonamides, it makes a good shotgun treatment when complete examination is not practicable. It is not effective against *Pseudomonas*, *Proteus* or *A. aerogenes*. It is eliminated rapidly in the urine and in severe infections 300,000 units should be given intramuscularly in aqueous solution every 6 hours. Later in the course of the disease procaine penicillin, which is slowly absorbed, can be given once daily. Penicillin is effective in a wide pH range but is more potent in acid urine. Toxic reactions are rare but occasionally troublesome; allergic dermatitis develops.

Streptomycin is effective against *E. coli*, *Proteus vulgaris*, *A. aerogenes* and *Pseudomonas*. It would be the agent of choice in these infections were it not for the severe toxic reaction. The aqueous solution often affects the eighth cranial nerve and causes an irreversible loss of equilibrium. The dihydrochloride of streptomycin may cause deafness. Both are nephrotoxic. Because of these severe reactions its use is not advised for periods of more than from 5 to 7 days and then only in fulminating cases and postoperative treatment when the oral administration of other agents is of doubtful value. The dose is 0.5 gm. every 6 hours the first day and 0.5 gm. twice daily thereafter. It is important to alkalinize the urine; this can be accomplished by giving 1 gram of sodium bicarbonate or potassium citrate every 4 hours. It is not effective when given orally and must be given intramuscularly. Its use has been almost abandoned except in tuberculosis of the genitourinary tract, which requires such drastic therapy that the reactions to streptomycin may be disregarded.

Aureomycin is effective in the treatment of infection caused by *E. coli*, *A. aerogenes*, *Str. faecalis*, *Staph. aureus* and *Str. hemolyticus*. It is the antibiotic of choice against *E. coli* and *A. aerogenes*. *Pseudomonas* and *Proteus* are resistant. It is administered orally beginning with an initial dose of 2 grams followed by 0.5 gram every 6 hours. The incidence of allergic reactions is minimal. Mild diarrhea and nausea are common but not disturbing. A crystalline aureomycin is available for intravenous use but has had few indications.

Chloramphenicol is very effective against *E. coli* and *A. aerogenes* and is of value against *Staph. aureus* and *Str. hemolyticus*. Claims that

it is effective against *Proteus* infection of the urinary tract have not been substantiated. An initial dose of 2 grams is given by mouth and 0.5 gram every 6 hours thereafter is usually prescribed. Toxic reactions are minimal and chiefly gastrointestinal.

Terramycin is similar to aureomycin and chloramphenicol in therapeutic effect dosage and reactions.

Polymyxin is given by intramuscular injection. It is severely neurotoxic and nephrotoxic in doses of over 2.5 mg per kg body weight in 24 hours. The toxicity renders its general use inadvisable. Its importance lies in the fact that it is effective against *Pseudomonas* infection, and could be given for a short period to eradicate this severe and resistant organism. *Proteus* is resistant to polymyxin.

Other antibiotics recently discovered have not been given a clinical trial.

*Other drugs*—Mandelic acid, calcium mandelate and other derivatives of mandelic acid are widely used in chronic cases in which the organism has become resistant to sulfonamides and antibiotics. They owe their germicidal effect to the acidity of the urine following their administration. These drugs are valuable adjuncts to therapy with antibiotics except streptomycin, which is more effective in an alkaline urine. Mandelamine, a combination of mandelic acid and methenamine, is a valuable remedy following sulfonamide and antibiotic therapy. It can be used over a long period without deleterious effect, and is most valuable in patients with urinary retention caused by hydronephrosis, hypertrophy of the prostate or diverticula.

Pyridium enjoys a wide use. It is bacteriostatic but scarcely bactericidal. It is used chiefly as a sedative in patients with urinary frequency and bladder irritability and is used following sulfonamides and antibiotics. Like selenium and methylene, it has an ocular psychic effect because the patient can see the color in the urine.

#### MISCELLANEOUS

*Abacterial pyuria* may present a difficult problem with an acute fulminating onset and negative urine cultures. The symptoms are not relieved by urinary antiseptics. Tuberculosis should be ruled out. Relief is obtained by using neoarsphenamine or mapharsen. The cause has not been determined. It has been proposed that this disease may be caused by a virus or an occult staphylococcus infection.

*Infections of the prostate, seminal vesicles, epididymides and testes* are deep seated, form abscesses early, tend to become chronic and are not favorably effected by chemotherapy and antibiotics. The agents employed for other urinary tract infections are used with indifferent results. Local measures such as massage, irrigation, diathermy or operative drainage are often necessary.

The symptoms of *prostatovesiculitis* have little relation to the severity of the pathologic changes. Many patients with this disease become a psychic problem.

#### SUMMARY

Patients with urinary tract infections tend to recover spontaneously except in the presence of stasis, calculus, diverticulum, foreign body or other associated pathologic conditions. The excellent results reported for certain agents in the treatment of a series of patients is often the result of this tendency to recovery. Sulfonamides should not be used for longer than 2 weeks because of the danger of renal damage. Bacteria become resistant to antibiotics in from 5 to 10 days, and a change of the therapeutic agent is then necessary. Acidification of the urine is beneficial except in sulfonamide-streptomycin therapy. The value of combined sulfonamide and antibiotic therapy has been definitely established. Adequate drainage and a daily fluid intake of about 3,000 cc are of paramount importance. Mandelamine, mandelic acid derivatives, pyridium, and other nontoxic therapeutic agents are valuable in the follow-up treatment.

# Injection of the Lumbar Intervertebral Disks

A Diagnostic Method

Thomas L. Hoen M. D. (1)

William H. Druckenmiller Commander MC, U S N (2)

Albert W. Cook, Lieutenant, junior grade MC U S N R. (2)

**P**ATHOLOGIC changes within the intervertebral disk and rupture of the disk capsule with herniation of disk material had been described by Beadell (3) in 1931 and noted by von Luschka (4) and Kocher (5). It was not, however, until the studies of Mixter and Barr (6) that the clinical significance of these lesions was recognized. Since that time a vast amount of literature has appeared concerning this syndrome and in 1948 Spurling and Grantham (7) summarized the experiences of these years when they wrote "The disc controversy continues unabated fourteen years after the classic description of the disorder by Mixter and Barr. Unfortunately the controversy is not confined to treatment methods but includes pathologic and clinical diagnostic problems as well. It is our contention that recognition of the pathologic variations of disk disease reduces the controversial aspects of both diagnosis and treatment (8)."

Many surgeons believe that severe unilateral (occasionally bilateral) sciatica with unequivocal signs of a herniated disk in the lumbar re-

(1) Consultant in Neurosurgery

(2) U. S. Naval Hospital, St. Albans, L. I. N. Y.

(3) Beadell O. A.: The Intervertebral Discs. His Majesty Stationery Office London 1931

(4) von Luschka H. Die Hohlgelecke d. menschlichen Körpers. C. Reimer Berlin, 1858. Quoted by Bradford, F. K. and Spurling, R. G. The Intervertebral Disc, 2d edition. Charles C Thomas Publisher Springfield, Ill. 1945

(5) Kocher T.: Die Vorlesungen der Wirbelkrankheiten zugleich als Beitrag zur Physiologie des menschlichen Rückenmarks. Mitteilungen d. Grenzgeb. d. Med. u. Chir. 1: 415, 1896. Quoted in reference footnote (13).

(6) Mixter W. J. and Barr J. S. Rupture of intervertebral disk with involvement of spinal canal. New England J. Med. 211: 210-215 Aug. 2, 1934

(7) Spurling, R. G. and Grantham, E. G.: Ruptured intervertebral discs in lower lumbar regions. Am. J. Surg. 75: 140-158, Jan. 1948.

(8) Hoen, T. L., Anderson, R. K., and Clark F. B. Symposium on neurosurgery: I. Loss of intervertebral discs. S. Clin. North America 28: 456-466, Apr. 1948.

gion is the only indication for surgical intervention. Even those surgeons however who operate only on patients with these symptoms and signs report a certain percent of negative explorations. In an attempt to improve the existing methods of diagnosis in such cases Hoen et al (8) reported the use of diagnostic disk injections at operation recalling to mind Dandy's (9) concept of the concealed disk and pointing out that the fundamental pathologic process in this syndrome was that of degeneration of the disk without rupture of the capsule. They found that degenerated disks easily accepted many cubic centimeters of normal saline whereas the normal disk could not be injected. Lindblom (10) extended this concept to the use of this procedure as a preoperative measure. Under fluoroscopic control he introduced a spinal needle into the disk space and subsequently injected an opaque medium. It was believed that, in this manner the direction and nature of posterior and posterolateral protrusions of lumbar intervertebral disks could be demonstrated.

As a result of this report and of our completely satisfactory experiences with injection of lumbar disks at operation, we have employed disk injection as a preoperative diagnostic procedure in the study of intervertebral disk disease. Our interest was further stimulated by the fact that we had found at times that a careful history, physical examination and pantopaque myelography were insufficient for a positive diagnosis and localization. We did not however feel justified in performing this procedure on patients in whom clinical examination and pantopaque myelography were considered conclusive. It is our purpose to report the use of this procedure on patients with equivocal clinical and myelographic findings.

### PROCEDURE

The patient is placed in the lateral horizontal position for lumbar puncture and 20-gauge needle is introduced into the subarachnoid space at the desired level. After obtaining cerebrospinal fluid the needle is advanced into the disk space and the position checked by fluoroscopy and pantocentgenograms (fig 1). A syringe containing normal saline solution is then attached to the spinal needle and injection is attempted. In patients with degenerated disks from 3 to 10 cc. of saline solution can be injected into the disk with relative ease. The injection becoming progressively more difficult it is continued, immediately before the injection, but after the needle is in place the patient is informed that something will be done and is instructed to describe the

(9) Dandy, W. E. Concealed ruptured intervertebral discs: plan for elimination of contrast medium in diagnosis. *J. A. M. A.* 117: 821-823, Sept. 6, 1941.

(10) Lindblom, K. Diagnostic puncture of intervertebral disc in sciatitis. *Acta orthop. Scandinavica* 17: 231-239 1948; *Med. Med.* 38: 1256, 1948.



*Figure 1—Lateral roentgenogram of the lumbosacral spine showing spinal needles within the intervertebral space.*

operator any new sensation that he experiences. In those in whom the injection is into a pathologic disk the patient often states that he is now experiencing the exact pain that characterized his attacks. As a variation in several patients 1 percent procaine solution was substituted for normal saline solution. Here again the positive results were dramatic. When the degenerated disk became distended the patient complained that his pain was reproduced or accentuated, within 2 or 3 minutes the pain disappeared.

#### MATERIAL

This procedure has been performed on 16 patients (table 1). In 12 a positive result was obtained and in 3 the disk was found to be normal. The remaining patient was one in whom a spinal fusion had been performed previously and although injection was attempted the needle could not be introduced into the disk space at the desired level.

In the 3 in whom the disk was found to be normal injection was attempted both in the fourth and fifth lumbar disks. Two pathologic disks were found in only 1 of the 12 patients with disk disease and the validity of the positive disk injections was confirmed (at operation) in all cases. Of the 3 in whom the results were negative 1 has been returned home another has been discharged to duty and the third now attends a mental hygiene clinic. The one patient in whom disk injection

failed was explored because of the everty of his symptoms. The findings were failure of fusion and degeneration of the intervertebral disk at the fourth lumbar interspace. Two patients with atypical disk disease in whom injection proved helpful are here described demonstrating the value of this procedure as a diagnostic aid.

TABLE 1.—Results of injecting intervertebral disks in 16 patients

Case	Lumbar spaces injected	Myelography	Injection result	Operative finding
1	Fourth	Equivocal	Positive	Protrusion
2	Fifth	Equivocal	Positive	Extrusion**
3	Fifth	Equivocal	Positive	Extrusion
4	Fourth	Negative	Positive	Extrusion
5	Fourth and fifth	Negative	Negative	No operation
6	Fourth (inflow)			Degeneration***
7	Fourth and fifth	Negative	Negative	No operation
8	Fourth and fifth	Equivocal	Positive (both spaces)	Degeneration
9	Fourth and fifth	Negative	Negative	No operation
10	Fourth	Equivocal	Positive	Protrusion
11	Fourth	Negative	Positive	Protrusion
12	Fourth	Negative	Positive	Degeneration
13	Fourth and fifth	Negative	Positive (fourth space)	Degeneration (fourth space)
14	Fourth	Negative	Positive	Protrusion
15	Fourth	Negative	Positive	Extrusion
16	Fifth	Negative	Positive	Degeneration

\*Protrusion signifies that the disk material is confined to the intervertebral space but causes bulge in the posterior ligamentous structures.

\*\*Extrusion denotes the disk material has escaped from the disk space.

\*\*\*Degeneration is used to describe the pathologically soft, boggy disk with an intact capsule.

## CASE REPORTS

Case 1.—A 40-year-old man entered this hospital because of severe intermittent pain down the posterior aspect of the right lower extremity following low back injury 4 years previously. He had been hospitalized elsewhere on several occasions because of this pain but no definite diagnosis had been made. His pain extended down the posterior aspect of the right thigh and leg into the lateral border of the right foot. It was not aggravated by coughing, sneezing or straining and had become most severe in the weeks prior to admission. Walking and the upright position afforded almost immediate relief of his pain and as soon as the supine position was assumed the pain would return. Following the onset of the most recent attack he had been unable to sleep in bed.

Physical examination showed that he was in acute distress. The pertinent findings were confined to his low back and right lower extremity. There was no tenderness over the low back and bending in all

directions was not painful. Straight leg raising was not restricted. Lasegue's sign was not elicited. Hyperextension of the lumbar spine did not produce pain down either lower extremity but when the patient assumed a sitting position he noted a tingling sensation in his right foot. The deep tendon reflexes were found to be normally active and equal, except the right achilles reflex which was markedly decreased. A linear area of hypalgesia was found along the lateral border of the right foot and over this same area the skin temperature was lowered. Roentgenographic examination of the lumbar spine showed no abnormalities.

The findings on physical examination suggested impaired function of a single nerve root, and pantopaque myelography was performed with the hope that the nature of this disturbance could be ascertained. This procedure showed a slight elevation and blunting of the root sheath column at the level of the fifth lumbar intervertebral disk. Injection of the fifth lumbar disk was performed according to the technic outlined previously. After radiologic confirmation normal saline solution was slowly injected into the disk space. Four cubic centimeters of this solution were introduced followed by an increase in the pain down the right lower extremity. When an additional 2 cc. of the fluid was injected the pain became severe and was described as being identical to the pain which was present prior to his entry into the hospital. This sudden increment in the severity of pain did not persist as long as was expected. In fact it subsided almost as quickly as it appeared.

The result of this injection was considered positive and subsequently the fifth lumbar disk was explored through a right interlaminar approach. The nerve root was found to be bound down to an extruded piece of disk material situated at the intervertebral foramen. The latter was removed in one piece and only a small amount of degenerated disk material could be removed from the narrowed intervertebral space. There was no evidence of any other lesion associated with this nerve root. Postoperatively the patient made an excellent recovery and by the time of his discharge was completely asymptomatic.

*Comment*—The clinical findings were entirely limited to the distribution of the first sacral nerve root with a complete absence of back pain. The obvious question was whether the diagnosis was that of a disk herniation or an isolated lesion of the first sacral root such as a cyst or tumor. The myelograms added little to our knowledge of the situation but injection of the fifth lumbar disk disclosed the presence of disease in this structure. In addition it was felt that disk material had been extruded through the posterior ligamentous structures because immediately on the injection of normal saline solution the patient's root pain was reproduced exactly but because the pain lasted only a short time it seemed apparent that the system into which the solution had been injected was not closed suggesting that a defect in the ligamentous structures was present allowing escape of the injected fluid.



**Case 2.**—A 37-year-old man entered this hospital because of intermittent pain low in the left side of the back of several years duration. There was no history of trauma to the back that could be correlated with his symptoms and he had received only temporary relief from drug therapy treatments.

One day prior to admission severe low back pain suddenly returned while he was in bed. He was unable to move from this position for several hours. The pain gradually decreased and on the next day he was admitted to the hospital in a wheel chair. There had never been any radiation of pain to either lower extremity but coughing aggravated the back pain occasionally. Examination showed that he could not assume an erect posture because of severe back pain. There was scoliosis of the lumbar spine with the convexity to the right. There was loss of the normal lumbar lordosis without interlaminar tenderness. Hyperextension of the lumbar spine was found to be impossible because of severe low back pain produced by attempting this maneuver. Straight leg raising was not restricted and Lasague's sign could not be elicited on either side. All the deep tendon reflexes in the lower extremities were active and equal. There was no sensory deficit and roentgenographic examination of the lumbar spine did not reveal any abnormalities. Pantopaque myelography was performed and the findings were inconclusive. Because it was believed that there was not sufficient evidence for the diagnosis of a herniated intervertebral disk, injection of both the fourth and fifth lumbar disks was performed according to the technique discussed previously. At each space from 6 to 8 cc. of normal saline solution could be injected without difficulty and in each instance generalized severe low back pain was reproduced.

The fourth and fifth lumbar intervertebral disks were explored through a left interlaminar approach. The fifth lumbar intervertebral disk was found to be soft and degenerated and at the fourth interspace the disk was degenerated and sequestered. A large amount of pathologic material was removed from both interspaces and subsequently the patient made an uneventful recovery. When discharged from the hospital he was without low back pain, although there was still a loss of the normal lumbar lordosis.

**Comment.**—This patient had a completely degenerated disk which bulged against the posterior ligamentous structures and produced severe pain on weight bearing or during any activity which caused compression of two adjacent vertebrae. His history revealed marked and repeated instances of severe incapacitating low back pain with each exacerbation clearing slowly after a period of rest. There was no radiation of the pain into the lower extremities. Myelography was inconclusive. In this instance disk injection gave way of great assistance for on introduction of the normal saline solution the patient's exact symptomatology was reproduced. At operation the finding of degenerated soft disks at both spaces confirmed the diagnosis.

## DISCUSSION

It is well known that many herniations of the intervertebral disks are readily detected by clinical examination alone. This is particularly true when the herniation causes direct pressure on single or multiple nerve roots and is associated with characteristic postural changes. Another large number of lumbar disk herniations are identifiable by pantopaque myelography. It is also evident however that myelography fails to reveal a fair percent of disk lesions particularly in those patients in whom a degenerated disk protrudes only when he is in the weight bearing position or the vertebral column is under the strain associated with activities such as running, jumping, falling or lifting. This type of herniation often tends to recede when the patient is in a horizontal position and indeed it is frequently this type of herniation which may cause the patient to complain only of back pain without radiation into either lower extremity. Frequently myelographic defects are not in agreement with the clinical findings and are at times not confirmed at operation (11, 12).

We have long believed that in instances such as those enumerated the ordinary diagnostic procedures have many times been far from ideal with the result that either too many negative explorations are performed or that patients with actual disease are denied relief because of ultra conservatism. Having had much experience with the injection at operation of normal disks as well as obvious and questionable disk herniations it occurred to us that this procedure might easily be applicable as a preoperative diagnostic aid. We have found that degenerated disks will accept by direct injection large quantities of normal saline solution whereas it is not possible to inject a normal intervertebral disk. Furthermore disk extrusions which leave a defect in the ligamentous structures may receive at times unlimited quantities of the injected solution.

The question will undoubtedly be raised as to whether one damages the normal disk by introducing a needle into it and attempting to inject normal saline solution. Friberg (13) studying intervertebral disk punctures in cadavers from 12 to 20 hours after death found that he could make a hole in the annulus fibrosus of a lumbar intervertebral disk with a trocar having an outer diameter of 4.7 mm and that in spite of repeated flexion and extension of the spine under pressure and with great force disk material could not be made to herniate through this hole. In some instances he exerted as much as 8 kg. of axial pressure on the specimens but in no case was a prolapse produced.

(11) Raul, J. and Berglund, G. Results of operations for lumbar protruded intervertebral disc. *J. Neurosurg.* 6: 160-168, Mar. 1949.

(12) Scoville W. B., Moretz, W. H., and Haaklas W. D.: Discrepancies in myelography: statistical survey of 200 operative cases undergoing pantopaque myelography. *Surg., Gynec. & Obst.* 86: 559-564 May 1948.

(13) Friberg, S. Low back and sciatic pain caused by intervertebral disk herniation: anatomic and clinical investigations. *Acta chir. Scandinavica* (suppl. 64) 83: 1-114 1941.

Because the procedure of the injection of intervertebral disks has been found in our hands to be a useful aid in the diagnosis of lumbar disk herniations it is appropriate to discuss its advantages as well as its disadvantages when compared to other procedures used for the diagnosis of these disturbances. Besides being a further diagnostic aid in complicated cases in which both the clinical and myelographic findings are inconclusive this injection procedure also makes it possible to predict preoperatively the existence of multiple disk herniations as well as to localize single disk protrusions. It has the advantage over myelography that an irritating chemical is not used and thus does not have to be removed from the subarachnoid space.

The disadvantages fall into two principle categories. In that both false positive and false negative results may be obtained. A false positive result can be avoided by performing the procedure with the assistance of fluoroscopy and spot roentgenograms. In this way injections of the solution will not be made into tissues other than the intervertebral disks. False negative results may be observed when the injection is made into a portion of the disk which is not degenerated. In our experience this is a rare occurrence and usually can be corrected by injecting different depths of the intervertebral disk. Lastly we found that at times the introduction of the spinal needle into the fifth cannot be accomplished with the same ease as into the fourth lumbar disk.

### CONCLUSIONS

Preoperative injection of lumbar intervertebral disks is a useful measure in the diagnosis of disk disease in this region. This procedure should supplement rather than supplant the usual diagnostic methods. It is helpful in revealing lumbar disk change in patients with low back pain unaccompanied by sciatica. Its advantages as a diagnostic method are more than sufficient compared to its disadvantages to warrant its use in diagnostic problems involving lumbar intervertebral disk disturbances.

# The Surgical Treatment of Inguinal Hernia in Infants and Children<sup>(1)</sup>

Ogden C. Bruton *Colonel, MC U.S.A.*

Sam F. Seeley *Brigadier General, MC U.S.A.*

**A**LTHOUGH the operative treatment of inguinal hernia in infants and children is a well established and accepted procedure surgeons disagree as to the optimal age at which the infant should be subjected to operation. There is a growing belief that the repair of inguinal hernia in young infants is a simple and safe procedure and under optimal surgical conditions is indicated without too much delay when diagnosed (2,3). We wish to present an analysis of 100 consecutive patients operated on during a period of about 2 years in support of this contention.

According to Davison (4) 4.4 percent of full term and premature infants have inguinal hernia—82 percent of them in boys and 69 percent right sided. In our series 14 percent were premature although the expected rate of prematurity of all births is only 5 percent; 87 percent were boys, 67 percent were right-sided and 9 percent were bilateral, with 2 of the bilateral hernias occurring in girls.

An inguinal hernial sac represents a persistence of the fetal condition in which there is an outpocketing along the inguinal canal. The resulting hernias then are almost invariably of the indirect type and in our series all were indirect. Although a hernial sac or defect is present at birth the hernia itself may not be recognized until later or may never develop. Almost one-half of our patients were diagnosed before 6 months of age and 67 percent were recognized before 2 years of age.

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(1) Walter Reed Army Hospital, Washington, D. C.

(2) Groes R. E.: Personal communication.

(3) Schiebel, H. M., and Freeman W. H.: Treatment of inguinal hernia in infants and children. *South. M. J.* 43: 605, 1950.

(4) Davison W. C.: *The Complete Pediatrician*. Dak. University Press, Durham, N. C. 6th edition p. 37, 1949.

Inguinal hernia is likely to be symptomatic unless incarceration occurs. In only 2 of our patients was pain mentioned in the absence of incarceration. Incarceration occurs frequently, especially in the young infant. The parents of 19 of our patients required a doctor to reduce the hernia, a total of 34 times prior to operation. Many other times hernias were considered incarcerated but were successfully reduced by the parents. Nineteen patients required operative intervention because of incarceration or strangulation. 15 of these occurred under 1 year of age. Hydrocele was associated with hernia in 23 patients in this series. The hydrocele was often of such small size as to be unrecognized prior to operation and in these patients did not confuse the clinical picture of hernia.

Spontaneous cure is uncommon but is possible up to the age of 6 months (5). Little hope should be given parents for natural cure either with or without the use of various forms of truss. The infrequency of the use of truss in our series would appear to attest to the futility with which this form of treatment is held among various physicians treating these children prior to operation. Only 7 patients had used a truss for a time varying from 2 days to 4 years without apparent benefit in any case. The hernia of the patient using a truss for 2 days became incarcerated after that time and required operation. There was some question as to whether or not the truss was a causative factor in the incarceration. Schiebel and Freeman (3) reported indifferent results with the use of trusses and in no case did the sac disappear as a result of this treatment. Under conditions unfavorable to surgical repair if some form of temporary treatment seems indicated, the yarn truss described in standard surgical and pediatric texts may be used until more favorable conditions exist.

The definitive treatment of hernia is surgical. In the 100 patients operated on, 104 hernias were repaired. Five of the patients with bilateral hernia had previously had a repair on one side. At the time of operation 20 percent were under 6 months of age and 41 percent were under 2 years of age. The Bassini operation was used on 5 patients and the Ferguson or modified Ferguson on the other. The suture material was almost invariably silk cotton being used on 4 patients and catgut on 1. The open drop ether method was used to induce anesthesia. The contents of the hernial sac were reported as small bowel, large bowel and appendix, omentum, testes, ovary and lipoma in that order of frequency.

Although no complications were reported, a 6-week-old boy was operated on during the course of respiratory infection which progressed to a frank pneumonia after he developed an irreducible incarceration. There were no deaths in this series. The average hospital stay was 9.3

(5) Ladd, W. E., and Gross, R. E. *Abdominal Surgery of Infancy and Childhood*. W. B. Saunders Co. Philadelphia, Pa. 1941, p. 357.

days 23 patients stayed in the hospital from 2 to 5 days. There appeared to be no difference in the end results of patients having a long and those having a short hospitalization. Although no long term follow up observations were made on all of these patients for an evaluation of the final results of operation they all had a 3 month postoperative check-up and most of them returned to the hospital later for other treatment. There has been no known case of recurrence or testicular atrophy.

It would appear from the foregoing analysis that in a hospital having well-trained anesthetists surgeons with great gentleness of technic and experience in handling delicate tissues in babies and where asepsis is rigid and complete young infants tolerate the repair of an inguinal hernia extremely well. Even better results can be expected from elective operation in the young infant rather than waiting and performing an emergency operation at the time of incarceration.

#### CONCLUSIONS

Inguinal hernia is a common condition which being a congenital defect is frequently diagnosed in the first 2 years of life. Incarceration necessitating operative intervention is frequently encountered under 1 year of age in infants with inguinal hernia. Under optimal surgical conditions infants less than 1 year of age tolerate the repair of a hernia extremely well.

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# Orbital Decompression, Transmaxillary Approach<sup>(1)</sup>

## Report of a Case

Adrian J Delaney *Captain, MC, U S N*

Samuel H Oliver *Commander MC, U S N*

**S**ELDOM do lesions of the orbit require emergency surgical treatment (2) In fact Holloway (3) has stated that in 32 years he had not seen a patient with cellulitis or abscess of the orbit in whom either a Krönlein (4) or Naffziger (5) procedure was indicated. Even so acute cellulitis of the orbit is not uncommon (2) (6-10) and prior to the use of antibiotics was attended by serious complicating extension to the meninges in about 10 percent of the patients (11). One observer (12) as late as 1937 reported death by meningitis in 6 of 9 patients with orbital cellulitis

The fulminating extension of inflammatory processes from the sinuses and contiguous structures into the orbit has been related to the following primary conditions ethmoiditis in children under 13 years

(1) U S Naval Hospital, National Naval Medical Center Bethesda, Md.

(2) Benedict W L: Diseases of orbit. Am. J Ophth 33: 110 Jan. 1950

(3) Holloway T: Inflammatory exophthalmos in catarrhal disorders of accessory sinuses (Abstract of discussion.) Arch. Ophth. 15: 474 Mar 1936.

(4) Krönlein. Zur Pathologi und Operativ. Behandlung der Dermoidkystender Orbita Beiträge zur Klin. Chirug IV 1 1887

(5) Naffziger H. C. Progressive exophthalmos following thyroidectomy; its pathology and treatment Ann. Surg. 94: 582-586, Oct. 1931

(6) Cohen, M.: Inflammatory exophthalmos in catarrhal disorders of accessory sinuses T Sect Ophth. A. M. A., pp 209-228, 1935 also Arch. Ophth. 15: 457-476 Mar 1936.

(7) O'Brien, C. S., and Leinfelder P J.: Unilateral exophthalmos; etiologic and diagnostic studies in 82 consecutive cases. Am. J Ophth 18: 123-132, Feb 1935

(8) Smith, A T and Spencer J T., Jr: Orbital complications resulting from lesions of sinuses. Ann. Otol. Rhin. & Laryng. 57: 5-27 Mar 1948.

(9) Hickman, W R.: Periorbital cellulitis; report of 4 cases J Indiana M A 41: 501-504 May 1948

(10) Donahue H. C. Orbital cellulitis followed by total blindness Am. J Ophth. 29: 1574-1577 Dec. 1946.

(11) Hodson, A C.: Primary Tumors of the Optic Nerve Roy London Ophth Hosp Rep. 18 (pt.3) 317-439 1912.

(12) Hubert L. Orbital infections due to nasal sinusitis study of 114 cases New York Star J Med. 37 1559-1564 Sept 15 1937



of age (13) frontal and maxillary sinusitis in the adult (2) furuncle in the vestibule of the nose lacrimal sac phlegmon, dacryadenitis palpebral abscess cavernous sinus thrombosis osteomyelitis periostitis actinomycosis injury dental infection, influenza erysipelas scarlet fever and smallpox. The causative organism is most commonly reported as a streptococcus or staphylococcus (2). In 75 consecutive cases of unilateral exophthalmos 32 were inflammatory (7).

If the patient presents at first marked edema of the lids with exophthalmos and limitation of motion, radical measures are immediately advisable (14).

When loss of vision or other serious damage seems evident, surgery of the orbit is justified (15). Sparth (16) advises that Cellulitis (within the orbit) is occasionally properly incised and no suppuration uncovered. Drainage should be established in these however just the same. The greatest error is not premature incision and drainage but delay of incision and drainage. Axenfeld (17) even advises in these desperate cases of acute inflammation, a Krönlein operation which may expose the infected locality.

#### CASE REPORT

A 26-year-old man was admitted to the hospital on 23 August 1950 complaining of rapid onset of swelling pain and blindness in the left eye of 8 hours duration. The past history indicated that on or about 1 August he had had swelling of the left orbit which had subsided rapidly under treatment with penicillin. The condition had been treated as an acute sinusitis and there had been no interference with vision or ocular movements.

Examination on admission revealed an apprehensive young man in great distress. The right eye was normal and had a visual acuity of 20/20. The left eye presented a proptosis of 11 mm and retrobulbar resistance was so increased that the eyeball could not be palpably shifted. Both left eyelids were slightly reddened and thickened. The upper lid was indurated. Neither lid was warm to touch. The upper lid was ptotic. The bulbar conjunctiva was markedly injected, chemotic and protruded in a sausage-roll manner through the immobile

(13) Davis W. B. Sinusitis in children. *Ann. Otol. Rhin. & Laryng.* 41 493-500, June 1932.

(14) Porter C. T. Etiology and treatment of orbital infections. *Ann. Otol., Rhin. & Laryng.* 41 1136-1141 Dec. 1932.

(15) Benedict, W. L. Surgical treatment of tumors and cysts of orbit; elevench de Schwelartz lecture. *Am. J. Ophth.* 32: 763-773 June (pt. 1) 1949.

(16) Sparth, E. B. *The Principles and Practice of Ophthalmic Surgery* 3d edition. Lea and Febiger Philadelphia Pa., 1944. p. 89.

(17) Axenfeld: *Ueber plastischen Verschluss der Orbita*. Bericht der 27 Versammlung deutscher Kathol. und Aerzte 1903 cited by Wood, C. A. Part V Chap. E Some operations on the orbital walls and contents. In Wood, C. A. (ed.): *A System of Ophthalmic Operations* Vol. I. Cleveland Press Chicago, Ill. publishers 1911. pp. 813-860.

lids. The eyeball was fixed in the primary position. There was tenderness on deep palpation. The cornea and anterior chamber were normal. The pupil was dilated and absolutely areflexive. The media were clear. The retinal veins were slightly engorged and edema of the retina was seen in the posterior pole. There was no light perception in the left eye. The remainder of the physical examination was negative except for slight clouding of the left anterior group of paranasal sinuses on transillumination. The leukocyte count was 16 000.

Treatment with 300 000 units of penicillin t.i.d. and 500 mg of aureomycin every 6 hours was started. It was obvious that we were confronted with a fulminating orbital cellulitis which had not reached the stage of abscess formation when first seen. The source of the orbital inflammation could not be determined because there was no evidence of purulent discharge in the left side of the nose or nasopharynx, no point tenderness over the left anterior group of sinuses and no pus on irrigation of the left maxillary sinus. The eye was already blind and it was believed that permanent loss of all or part of the central vision would be unavoidable unless an adequate decompression of the orbit could be obtained. The Naffziger Shugrue-Moran and Sewall techniques were deemed inadvisable for one reason or another. The transmaxillary approach described by Hirsch (18) for decompression of the orbit in malignant exophthalmos appealed to us because of its simplicity, its ready availability, the feasibility of using local anesthesia, and the fact that no special instruments are needed. It was decided to open the antrum through the canine fossa and to inspect the interior. If frank pus should be found, only adequate drainage of the sinus through the inferior meatus of the nose would be accomplished.

On the day of admission the patient was taken to the operating room. Analgesia was obtained by preliminary administration of secenal and meperidine hydrochloride 90 minutes before operation. The nasal fossa on the left was well cocainized, including the area of the sphenopalatine ganglion. The maxillary division of the trigeminal nerve was blocked with 2 percent procaine using the infrazygomatic approach. The gums over the left canine fossa were thoroughly infiltrated with procaine. A horizontal incision was made 1 cm. above the gum margins of the upper left lateral incisor, canine and premolar teeth. The mucoperiosteum was widely elevated and the antrum opened at a level 1 cm. above the line of incision. A large window was made in the anterior wall of the antrum and the contents of the sinus were thoroughly inspected. A cystic degeneration of the lining mucosa was seen. The entire mucosa was removed with little difficulty leaving clean bare walls. The roof of the sinus was then reduced to tissue-paper thickness by long handled polishing burs. The bone underlying the infraorbital nerve was spared but the remainder of the roof of the antrum

(18) Hirsch, O.: Surgical decompression of malignant exophthalmos. *Arch. Otolaryng.* 51: 325-334, Mar. 1950.

was thinned and removed without disturbing the orbital periosteum. After the periorbital had been uncovered over a large area the fascia was incised from behind forward on each side of the infraorbital groove. This resulted in an immediate bulging of the orbital fat into the maxillary sinus and in a subjective sense of relief of pressure for the patient. A large window was then created into the inferior meatus of the nose and iodoform gauze was packed lightly into the sinus. The mouth wound was then tightly closed over bone.

The patient tolerated the operation very well and felt great relief. Although there was no spectacular objective improvement, retrobulbar resistance was however palpably decreased. The patient spent a comfortable night. On 25 August the objective findings were essentially the same except that the brawny induration in the left upper lid now showed an area of beginning softening in the upper outer aspect. Incision and drainage in this area recovered 15 cc. of thick yellow-brown pus from which an alpha streptococcus was cultured.

Immediately after drainage of the abscess the proptosis began to recede. The drainage continued for 12 days after which no further discharge could be obtained from the orbit. The conjunctival chemosis subsided gradually over a period of 3 weeks. Central vision began to reappear 2 days after the abscess was drained, and improvement



Figure 1—Photograph of patient taken 4 months after operation showing the exophthalmos which was produced.



Figure 2.—Another patient in whom the entire left maxilla had been removed because of carcinoma. Although the entire floor of the orbit and the inferior orbital rim are absent the orbital periorbital tissue was not disturbed, and no enophthalmos occurred.

progressed rapidly. Ten days postoperatively the patient could count fingers at 6 feet with the left eye. Fourteen days postoperatively the vision was 20/30 and this had improved to 20/20 3 weeks later following patch occlusion of the right eye. Unfortunately the visual fields did not improve as well as was expected. Four months after the orbital decompression there was still marked restriction of the peripheral fields nasally and superiorly. The extraocular movements had returned completely except for slight restriction of adduction. There was no diplopia. The exophthalmos of the left eye which measured 11 mm. more than the right eye on admission, was gradually replaced in the 4 months following operation by a moderate enophthalmos (figs. 1 and 2) measuring 2.5 mm. less than the right eye.

*Comment*—The treatment of orbital cellulitis frequently includes several specialties. In the case presented early consultation between the rhinologist and ophthalmologist permitted the prevention of blindness. Fralick (19) emphasizes the fact that the neurosurgeon has proved to the ophthalmologist the value of the transcranial approach.

(19) Fralick, F. B. The orbit, review literature. Arch. Ophth. 44: 437-453, Sept. 1950.

for the removal of orbital lesions. Many and varied surgical approaches to the orbit have been introduced especially in attempts to cure decompression for relief of acute inflammatory and malignant (thyrotropic) exophthalmos. Operations on the orbital walls have been described as follows: (1) removal of the roof of the orbit by the transcranial approach (Naffziger) (5) (16) (20-22); (2) removal of the lateral wall by modifications in the original Krönlein approach (16) (23) (24); (3) removal of the medial orbital wall (25) (26) and (4) removal of the floor of the orbit by the transmaxillary approach (18) (27-30). The advantages and disadvantages to be considered in the choice of procedure are ably outlined by Hirsch (18).

### SUMMARY

The rapid onset of blindness in the patient with acute orbital cellulitis here presented was prevented by emergency orbital decompression. The transmaxillary approach is recommended for emergency decompression of the orbit for progressive exophthalmos.

(20) Naffziger, H. C. Our present knowledge of exophthalmos and its surgical treatment. *Cincinnati J. Med.* 29: 329-334, June 1948. *Ann. West. Med. & Surg.* 2: 397-401, Sept. 1948.

(21) Dandy, W. E. Results following transcranial operative attack on orbital tumors. *Arch. Ophth.* 25: 191-216, Feb. 1941. *corrected* 25: 749 Apr. 1941. *Ann. N. Y. Acad. Sci.* 43: 92-120, 1940.

(22) Love, J. G. and Benedict, W. L. Transcranial removal of intraorbital tumors. *J. A. M. A.* 129: 777-784, Nov. 17, 1945.

(23) Geyton, J. S. Decompression of orbit. *Surgery* 19: 790-809, June 1946.

(24) Swift, G. W. Malignant exophthalmos and operative approach. *West. J. Surg.* 43: 119-126, Mar. 1935.

(25) Sewall, E. C. Operative control of progressive exophthalmos. *Arch. Otolaryng.* 24: 621-624, Nov. 1936.

(26) Kistner, F. B. Decompression for exophthalmos—report of 13 cases. *J. A. M. A.* 112: 37-38, Jan. 7, 1939.

(27) Hirsch, O. and Urbach: Behandlung eines exzessiven Exophthalmos (Basedow) durch Entfernung von Orbitalfett von der Kieferhöhle aus. *Monatsschr. f. Ohrenh.* 64: 212-213, 1930.

(28) Meemann, A. Operative Behandlung des Malignen Exophthalmos. *Zentralbl. f. d. ges. Ophth.* 45: 161, 1940.

(29) Wust, K. Zur Behandlung der drohenden Optikusatrophy infolge retrobulbärer Hämangiome und der chirurgischen Zugänge zum retrobulbären Raum unter besonderer Berücksichtigung des permaxillären Weges. *Klin. Monatsbl. f. Augenh.* 114: 140-144, 1949.

(30) Lewkowicz, A. Zur permaxillären Eröffnung der Orbita. *Ztschr. f. Laryng Rhin., Otol.* 22: 370-375, 1932.

# Eosinophilic Granuloma of the Lung<sup>(1)</sup>

## Report of Two Cases

Charles J. Fadnacci Colonel, MC, U. S. A.

Hugh C. Jeffrey Major R. A. M. C.

Robert W. Lackey Major MC, U. S. A.

**A** BIOPSY of lung tissue from two patients recently treated at this hospital revealed an eosinophilic granulomatous lesion resembling the eosinophilic granuloma of bone. A survey of the literature indicates that although cases of eosinophilic granuloma of bone with roentgenologic evidence of pulmonary infiltration have been described, no histologic confirmation of a similar lesion in the lungs alone has been previously reported.

## CASE REPORTS

**Case 1**—In the winter of 1948-1949 a 32 year old man developed a chronic cough productive of from 50 to 120 cc of sputum daily. He complained of fatigue and sweats but denied having fever or chills. He was admitted to this hospital with the provisional diagnosis of pulmonary tuberculosis. He had lost about 40 pounds. He gave a history of exposure to dust from September 1947 to January 1948.

Physical examination was negative except for the presence of rales in both lungs. Roentgenograms revealed a patchy linear nodular parenchymal infiltration of both lungs (fig. 14). The total leukocyte count was 18,500 with 83 percent polymorphonuclear neutrophils but no eosinophils. A tuberculin (PPD first strength) skin test was 1 plus; a histoplasmin skin test was 2 plus and a coccidioidin skin test was negative. Repeated examinations of the sputum revealed no acid-fast bacilli or fungi.

On 24 August 1949 a thoracotomy was performed and tissue from the lower lobe of the left lung was removed for examination. The specimen consisted of a wedge of lung tissue measuring 5 by 1.5 cm. Pea-sized hard nodules were felt scattered throughout. Over the nodules the pleura

(1) Fitzsimons Army Hospital, Denver, Colo.

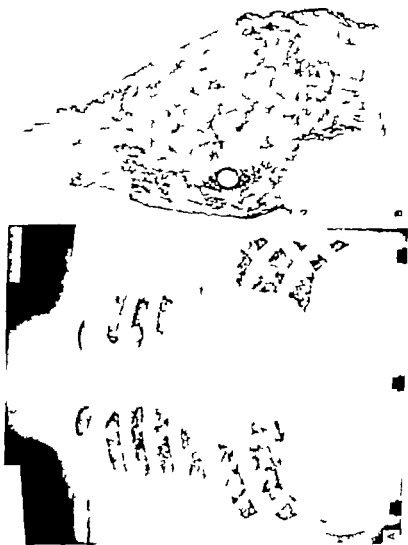


Figure 1.—Case 1. (A) Low power view showing nodular fibrinous exudate (fibrinous) lung. (B) Photomicrograph of lung tissue showing the characteristic nodular fibrinous exudate.

was thickened and hyalinized in some areas. The cut surface showed scattered irregular rounded grayish white nodules. The largest nodule measured 1 by 0.7 cm. Those that reached the pleura merged with it.

Histologic examination revealed a granuloma with an unusual eosinophilic polymorphonuclear infiltrate in the fibrosing milary lesions (fig. 1B). Many histiocytic cells and xanthomatous macrophages were also seen. There were a few lymphocytes and some foreign-body giant cells in among the fibrous trabeculae. The alveolar architecture in these areas was completely obliterated by this fibrous tissue containing the eosinophils, pigment laden macrophages and histiocytes (fig. 2).

Cultures from the lung tissue were negative for acid-fast bacilli and fungi. No organisms or parasites have been demonstrated in the special stains. This lesion had the appearance of an inflammatory granulomatous process rather than that of a neoplasm. The eosinophils and histiocytes lying in a fibrous stroma constitute a finding characteristic of an eosinophilic granuloma in bone.

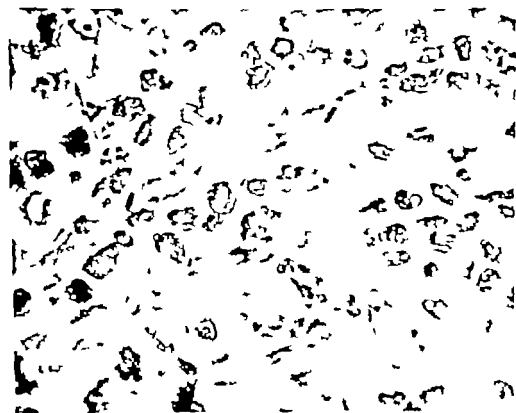


Figure 2—Case 1. Photomicrograph showing the pale-stained histiocytes and groups of dark-stained eosinophils.



**Case 2**—In September 1950 a 24-year-old man had a routine roentgenogram of the chest which showed a diffuse type of increased density throughout both lungs. He stated that he had had a chronic cigarette cough productive of from 4 to 6 cc. of thin whitish sputum daily for the preceding 2 or 3 years and that he had lost about 5 pounds in the preceding 8 months but he denied having chills, sweats, fever, hemoptysis, and malaise. His afternoon temperature in the hospital varied between 99 and 100 F. Prior to entering the Army he had driven truck carrying dry sand and cement.

Physical examination was negative except for the presence of a small, nontender, movable node in his left axilla. The total leukocyte count was 14,250 with 60 percent neutrophils and 10 percent eosinophils. A tuberculin (PPD second strength) test and skin tests for blastomycosis and histoplasmosis were positive. The coccidioidin skin test and the complement fixation test for histoplasmosis were negative. Repeated examination of the sputum and gastric washings were negative for *tubercle bacilli* and fungi. A roentgenogram of the chest on 24 October showed no change (fig. 3A). Roentgenograms of the hands and feet showed no abnormalities.

On 13 November thoracotomy was performed on the left side. Numerous firm bean-sized nodules could be palpated throughout both lobes of the left lung. The lung surface over these nodules was diaped. The hilar lymph nodes were not enlarged. Tissue for examination was taken from the upper and lower lobes of the left lung. The specimen consisted of two small pieces of tissue in which small, firm, but not stony nodules could be palpated. Their cut surface was yellow and not sharply circumscribed. They varied in size from 0.4 to 1.5 cm. in diameter. Smears and cultures for *tubercle bacilli* and fungi made from these lesions were negative.

Histologic examination revealed nodules replacing the lung tissue (fig. 3B). They consisted of bands of fibrous tissue containing lobulated masses of eosinophils and histiocytic cells (figs. 4 and 5). The histiocytes had large vesicular nuclei and the cytoplasm was fragmented in some. In others the cytoplasm was more abundant and vacuolated. Some large macrophages were laden with brown pigment. Scattered throughout were giant cells formed of nuclear aggregations with little cytoplasm. Occasionally typical foreign-body giant cells were seen. The eosinophils were numerous and in some areas they appeared in large clumps. These eosinophils were mostly of the mature type. This granulomatous process was not circumscribed but areas of lung wherein the architecture was completely destroyed adjacent areas which were relatively normal-appearing lung tissue were noted. No organisms or parasites were demonstrated in the specially stained sections prepared at the Armed Forces Institute of Pathology.

Roentgenograms of the long bones and skull taken 1 week after thoracotomy revealed no abnormalities.



Figure 3—Case 2. (A) Roentgenogram showing mottled density throughout both lungs. (B) Photomicrograph of lung tissue showing the nodular lesion.

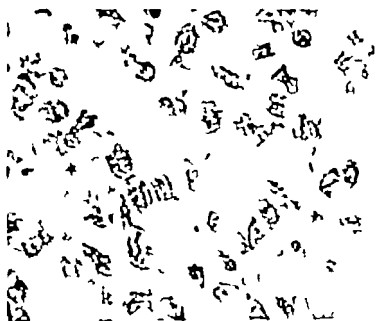


Figure 4.—Case 2. Photomicrograph showing a field in which the histiocytic cell predominates.



Figure 5.—Case 2. Photomicrograph showing a field in which the eosinophils predominate.

## DISCUSSION

Eosinophilic granuloma of bone was first reported by Finzi (2) as a myeloma with preponderance of eosinophilic cells. It was not until 1940 that this condition was established as a well-defined disease entity by Otani and Ehrlich (3) and Lichtenstein and Jaffe (4). Since the first descriptions of the disease there has been a tendency to expand the diagnosis of eosinophilic granuloma of bone to include those cases in which there are multiple bone lesions and even extra-osseous lesions, such as those involving lymph nodes, skin, lungs and other organs (5).

In 1949 Vanek (6) described six cases of an eosinophilic granulomatous process involving the submucosa of the stomach for which he suggested the term gastric submucosal granuloma with eosinophilic infiltration. Histologically the lesions were characterized by a fibroblastic reaction with an even distribution of eosinophilic cells throughout. Vanek considered these granulomatous lesions to be different from the eosinophilic granulomas found in bones. Polayes and Krieger (7) described a jejunal lesion which was histologically identical to that of Vanek's eosinophilic granuloma of the stomach and apparently did not have any relationship with eosinophilic granuloma of the bone marrow.

Curtis and Cawley (8) reported a 16-month old female infant with a widespread eosinophilic granulomatous infiltration of the skin and multiple skeletal defects. Biopsies of the cutaneous lesions revealed findings similar to those found in eosinophilic granuloma of bone. Biopsy of the skeletal lesions was not performed.

The pulmonary syndrome described by Löffler (9) occurs as transient pulmonary infiltrations, often recurrent, accompanied by cough, pyrexia, asthmatic symptoms and a high peripheral eosinophilia. Roentgenograms of the lungs of these patients show findings similar to those of eosinophilic granuloma of the lungs but as stressed by Caffey (10) the diagnostic feature in Löffler's syndrome is the fleeting and migratory char-

(2) Finzi, O. Mieloma con prevalenza dell'cellule eosinofile circoscritto all'osso frontale in un giovane di 15 anni. *Minerva med.* (pt. 1) 9: 239-241, Feb. 17, 1929.

(3) Otani S. and Ehrlich, J. C. Solitary granuloma of bone simulating primary neoplasia. *Am. J. Path.* 16: 479-490, July 1940.

(4) Lichtenstein, L. and Jaffe, H. L. Eosinophilic granuloma of bone with report of case. *Am. J. Path.* 16: 595-604, Sept. 1940.

(5) Henderson, E. D., Dahlin, D. C. and Bickel, W. H.: Eosinophilic granuloma of bone. *Proc. Staff Meet. Mayo Clin.* 25: 534-541, Sept. 13, 1950.

(6) Vanek, J. Gastric submucosal granuloma with eosinophilic infiltration. *Am. J. Path.* 25: 397-411, cl. 2 pl., May 1949.

(7) Polayes, S. H. and Krieger, J. L.: Eosinophilic granuloma of jejunum, hitherto undescribed location of the intestines. *J. A. M. A.* 143: 549-551, Jan. 10, 1950.

(8) Curtis, A. C. (Ann Arbor Mich.), and Cawley, E. P. Eosinophilic granuloma of bone with cutaneous manifestations: report of case. *Arch. Dermat. & Syph.* 55: 810-818, Jan. 1947.

(9) Löffler, W. Die flüchtigen Lungeninfiltrate mit Eosinophilie. *Schweiz. med. Wchschr.* 66: 1069-1078, No. 7, 1936. Cited in reference footnotes (10) and (12).

(10) Caffey, J. *Pediatric X-ray Diagnosis*, 2d edition. The Year Book Publishers, Inc., Chicago, Ill., 1950, p. 245.

acter of the roentgenographic changes. The morbid changes in the lungs have been examined in only a few cases (11); these studies revealed an exudative type of lesion. Specific allergenic factors such as amoeba, intestinal worms and plant pollens have been identified as causative agents in several cases (12). The elimination of these specific agents has resulted in permanent cure. On both histologic and persistent roentgenographic appearances our cases resemble the eosinophilic granulomas of bone rather than the eosinophilic infiltrations of Löffler and allied allergic reactions in the lungs.

Cases of eosinophilic granuloma of bone with pulmonary infiltration similar to our two cases have been described by others (13) (14) (15) but in none of these was biopsy of lung tissue performed and the authors could only infer that the pulmonary lesions were of the same nature as those found in the bones. That pulmonary infiltrations occur in eosinophilic granuloma has been recognized in retrospect since Rowland (16) reported the case of a 5-year-old boy who died from pulmonary fibrosis secondary to xanthomatosis. Since then many cases have been reported and reviewed.

Parkinson (15) suggested the possibility of pulmonary infiltration occurring as the sole manifestation of the chronic form of eosinophilic granuloma. Because in our two cases there was no evidence of co-existent osseous or other extra-osseous lesions we must conclude that these patients have no manifestations of eosinophilic granulomatous involvement other than the pulmonary lesions. These patients are being kept under observation for any further progress of the disease.

Farber (17) and Green and Farber (18) were the first to postulate that eosinophilic granuloma, Hand-Schüller-Christian disease and Letterer-Siwe disease represented variations in degree, stage of development and localization of the same basic disease process. Most authors who

(11) von Meyenburg, H.: Das eosinophile Lungeninfiltrat; pathologisch Anatomie und Pathogenese. *Schweiz. med. Wchnschr.* 72: 809-811, July 23, 1942. Cited as reference footnote (10) and by Lewis, G. M. and Coombs, F. E. Eosinophilic granuloma, theoretical and practical considerations based on study of case. *Arch. Dermat. & Syph.* 55: 176-193, Feb. 1947.

(12) Jones, S. H. and Souders, C. R. Eosinophilic infiltration of lungs (Löffler's syndrome). *New England J. Med.* 231: 356-358, Sept. 7, 1944.

(13) Weinstein, A.; Francis, H. C., and Speerthuis, B. F.: Eosinophilic granuloma of bone: report of cases with multiple lesions of bone and pulmonary infiltration. *Arch. Int. Med.* 79: 176-184, Feb. 1947.

(14) Schmuckert, H. F., and Perlman, H. B. Hand-Schüller-Christian disease and eosinophilic granuloma of skull. *Ann. Otol. Rhin. & Laryng.* 57: 645-676, Sept. 1948.

(15) Parkinson, T.: Eosinophilic xanthomatous granuloma with honeycomb lungs. *Br. M. J.* 1: 1029-31, June 11, 1949.

(16) Rowland, R. S. Xanthomatous and reticulo-endothelial system, correlation of undescribed group of cases described as defects in membranous bones, exophthalmos and diabetes insipidus (Christian's syndrome). *Arch. Int. Med.* 42: 611-674, Nov. 1928.

(17) Farber, S. Nature of "Solitary or eosinophilic granuloma of bone. *Am. J. Path.* 17: 625-626, 1941.

(18) Green, W. T., and Farber, S.: "Eosinophilic or solitary granuloma of bone. *J. Bone & Joint Surg.* 24: 499-526, July 1942.

have since written on eosinophilic granuloma of bone have accepted this point of view. Thannhauser (19) was of the opinion that eosinophilic granuloma of bone was the monosymptomatic form of a systemic granulomatous disorder in which histiocytes, eosinophils and xanthoma cells are observed in the lesion at different phases. He proposed the term eosinophilic xanthomatous granuloma as an all inclusive term for Letterer-Siwe disease, Hand-Schüller-Christian disease and eosinophilic granuloma.

The causative agent of eosinophilic granuloma has not been established. Most authors now believe it is caused by some infectious agent rather than a metabolic disorder on the basis of the type of tissue reaction and the acute febrile course in infants. The search for a bacterial, fungal, or viral causative agent has so far been fruitless.

### CONCLUSIONS

The term eosinophilic granuloma should be expanded to include those cases in which there are extra-osseous lesions such as those involving skin, lungs, and other organs. It is suggested that the two cases of pulmonary eosinophilic granuloma here reported are like eosinophilic granuloma of bone, the monosymptomatic form of a systemic xanthomatous disorder.

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(19) Thannhauser, S. J. *Lipidoses*. Oxford University Press, New York, N. Y., 1940.  
Cited by Thannhauser, S. J., Eosinophilic granuloma of bone. *J. A. M. A.* 134: 1437-1438  
Aug. 16, 1947; correction 135: 46, Sept. 6, 1947.



# The Talus in Congenital Equinovarus Clubfoot

Thomas M. Foley Jr. *Commander MC, U. S. N. (1)*

A REVIEW of a derangement of the talus which occurred frequently in 100 patients with congenital clubfoot is presented. This condition has not been described *per se* in the available literature. Lateral displacement of the distal end of the talus occurs frequently in congenital clubfoot. This altered relationship of the distal end of the talus to the line of the tibia and fibula can be observed on anteroposterior roentgenograms of the foot and lower leg (fig. 1). Occasionally the entire talus appears to be displaced (fig. 1A). In order to evaluate the nature of this displacement roentgenograms of normal feet were studied. It was found that when the normal foot was placed in a position of equinovarus the position of the distal end of the talus in the anteroposterior view was not appreciably affected except for a slight medial deviation in the direction of the deformity. Therefore it is considered that when lateral displacement occurs it represents a subluxation (figs. 1 and 2).

The mechanics for such a subluxation are easily understandable when one considers the anatomy of the astragalus and the character of the deformity of equinovarus. In this position the normal support of the malleoli, calcaneus and distal structures is lost. Concurrently stretching of the lateral ligaments occurs and the distal elements encroach on the space normally occupied by the talus. The longer this abnormal position is maintained the more apt the talus is to adjust itself to it in shape as well as in function. Descriptions of anatomic dissections of clubfeet in the literature have been based on the examination of old untreated cases and in these deformity of the talus has been described as an elongated neck pointing downward and inward. This however can be explained by a persistence of cartilage where the bones are in contact with each other growth subsequently occurring in that direction.

Being convinced that subluxation does occur and that there was a reasonable explanation for its existence it then became necessary to

(1) At the time of writing this article I was at Shriners Hospital for Crippled Children, Haddonfield, N. J. now U. S. Naval Hospital, Philadelphia, P.



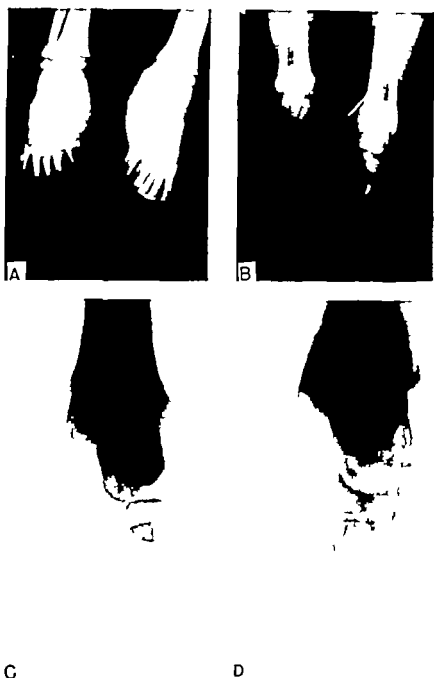


Figure 1—Talar subluxation in different patients and at different ages. (A) The talus appears to be almost completely displaced. (B) Normal foot for comparison with clubfoot. (C and D) Correction of angle has not been obtained and dorsiflexion remains limited.

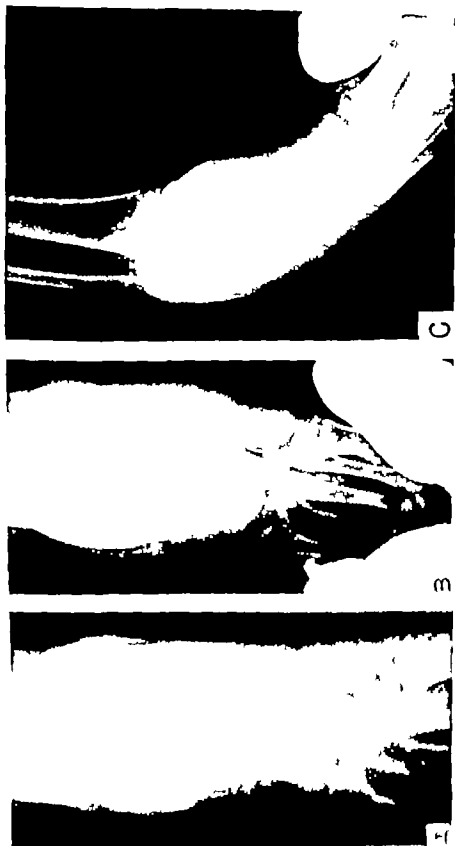


Figure 2.—The normal (A) in normal, (B) abduction, and (C) equinovarus. The talus is relatively stable and maintains its usual angle with the line of the tibia.

determine of what, if any clinical significance it might be. One hundred cases of clubfoot and the available roentgenograms were reviewed. Clinical examination of 50 percent of these patients was made. The clubfeet were classified as simple, persistent, and recurrent, based on the response to treatment rather than on any definable element found on original examination. It was found that the age at which treatment was started did not materially affect the ultimate result obtained within each group, and that the incidence of the persistent type was the same in those treated prior to 6 months of age as in those in whom treatment was started later. The persistent type was increasingly more common in those in whom treatment was started late or in those in whom treatment had been interrupted.

The lack of completeness and uniformity in reporting the conditions of the foot; the irregular intervals between reports and the diversity of the methods employed whether conservative or surgical made exact classification difficult and evaluation of results of treatment with any one method impossible. Roentgenograms of each patient were not available but a sufficient number were available to demonstrate that talar subluxation could occur as part of the original deformity although it was more commonly seen in the persistent and recurrent types particularly in the latter. On the basis of these observations it is believed that talar subluxation is of clinical significance only when it is a persistent part of the deformity and that consideration of its nature it could conceivably prevent satisfactory correction of the varus and equinus elements.

Although treatment of this subluxation *per se* has not been attempted, in view of the findings in this series it would appear that treatment may become necessary in certain persistent cases. Furthermore on the basis of the anatomic changes which can be expected this treatment should be devised to accommodate the condition at the various stage of growth. Therefore in the early cases attempts should be directed at reduction. Later, when the talus has accommodated itself to an abnormal position, efforts should be directed toward aligning the distal elements on the talus. This may not be possible and decision must be made whether to perform early open reduction or to maintain the degree of correction obtained by some apparatus until the age of the child will permit definite reconstructive procedure if then still necessary. In older child a subastragalar fusion would be indicated.

Regarding of the procedure employed it is believed that attempts to force correction, in view of the talar subluxation with its altered anatomical relationship, will cause damage to the ankle joint. Early damage to the ankle joint in young children may not be apparent because of the great mobility of the os calcis on the astragalus (fig. 3), but, since the mobility is gradually lost in adolescence increased evidence of ankle injury will then become manifest.

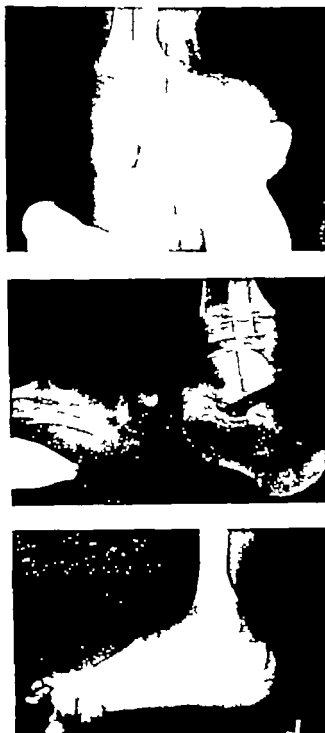


Figure 3—Lateral views of the foot of a normal 6-year-old child. The excursion of the talus and calcaneus from equinus through neutral to dorsiflexion is shown. Note how the calcaneus passes the talus to a same as its normal lateral position.

The ability to re-establish the talocalcaneal angle is still the best criterion for determining satisfactory correction of the heel varus; this must precede attempts at correcting the equinus deformity, as it is only then that the os calcis can pass the talus and assume its normal lateral contact as shown in figure 3. If the talar subluxation cannot be corrected, it is obvious that neither the angle nor the ability of the calcaneus to pass the talus can be re-established, unless the calcaneal deformity is overcorrected. If deformity of the talus prevents satisfactory ankle motion in itself, some consideration should be given to increasing the joint space by such operative procedures as low fibular osteotomy. Finally, in those patients with flexible recurrent subluxation in whom the talus is easily reduced and the equinus quickly corrected, a procedure such as transfer of the anterior tibial tendon laterally might preclude prolonged immobilization in a cast or brace.

### SUMMARY

Talar subluxation occurs in all types of equinovarus clubfoot and seems to be of clinical significance principally in the persistent type, although it is frequently observed in the recurrent type. It may be suspected clinically when a manually correctable heel varus recurs on weight bearing. It is verified by roentgenographic evidence of a decreased talocalcaneal angle with lateral displacement of the head of the talus.

# Armed Services Medical Regulating Office

Byron L. Stager, *Colonel, MC, U S A* (1)

Donald E. Domina, *Major MSC U S A* (1)

WHEN a wounded or sick soldier, marine, airman, or sailor arrives in the continental United States, there are two important questions on his mind. (1) How close to home are you going to get me? and (2) "When can I get some money? In the latter the Armed Services Medical Regulating Office (ASMRO) plays no role but in the former it is the key agency and is only too willing to furnish a prompt answer. Without his knowledge the movement of the average patient from the front line aid station to the port of debarkation in the continental United States and, subsequently, to a hospital for definitive treatment has been made according to a carefully-devised plan based on the many lessons in evacuation that former wars have taught. It is with the final phase of this movement that ASMRO is primarily concerned, yet to direct this final phase efficiently ASMRO has a concomitant interest in the entire chain of evacuation.

One of Webster's definitions for the term regulate is "To reduce to order, method, or uniformity; to regularize." In the accomplishment of its mission ASMRO uses many tools. The basic essentials are the patient, the mode of conveyance, the hospital bed, and speedy communication. Although all wars have created certain problems concerned with patient movement and control, these problems prior to World War II were relatively simple. The clear-cut requirement for getting the patient to a hospital having adequate facilities for a particular type of specialized treatment became clear in World War II. Because the number of specialists was insufficient to permit wide-spread activities, it became necessary to concentrate the professional potential and bring the patient to the appropriate physician. This requirement coupled with a transport system that had continually increased its speed and efficiency created a need for centralized control of patient movement which was fully recognized in 1943.

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(1) Armed Services Medical Regulating Office, Washington, D. C.

A centralized control system which became known as medical regulating was devised by the Army Surgeon General. This system worked effectively to bring about completely-coordinated patient evacuation. From the processing of a few thousand Army and Air Corps patients in the early stages of its development the Medical Regulating Office reached peak performance in May 1945 when it regulated the flow of nearly 60 000 patients into military hospitals in the continental United States.

Between August 1945 and the outbreak of hostilities in Korea, the work of this agency continued. Constant study was undertaken to improve the system; to make better use of medical facilities and, from the patient's viewpoint, to smooth out many of the details connected with the patient's movement. Rail and water were the chief means used for the transportation of patients during World War II. As the war progressed however, air evacuation to the continental United States became more and more popular gradually replacing most of the commoner modes of transportation. In the fall of 1949 the Secretary of Defense announced policy calling for the use of aircraft in the evacuation of all patients dependent only on aircraft availability and appropriate medical indications. Implementation of this policy brought about the lay-up of the last two active U. S. Army ambulance ships *U. S. S. Hope* and *U. S. S. Comfort*. The Hospital Train Unit at Letterman Army Hospital and the Hospital Train Detachment at Camp Kilmer, N. J. also became inactive. As a result the percent of patients returned to the continental United States by air increased from 30 in 1945 to about 98 in 1951.

During this transition period a study was undertaken to bring about a joint Army-Navy-Air Force medical regulating office. Early studies of the Department of the Army pertaining to medical regulating activities served as the embryo from which the present ASMRO was formed. After more than a year of analysis and rewriting conclusions were presented to the Joint Logistics Plans Committee which delved further into all problems resolved differences of opinion that arose from within the three services and submitted a charter to the Joint Chief of Staff. On 25 October 1950, the Secretary of Defense approved the charter. It was then forwarded to the Secretaries of the three Departments for implementation. ASMRO thus evolved and was established as a joint operating office in December 1950 under the Chief of Staff U. S. Army Executive Agent for the Joint Chief of Staff.

In organization and in spirit, it is truly a joint office (fig. 1). The office staff is comprised of commissioned officers from the three services U. S. Navy hospital corpsmen, and civilian employees. The charter outlines in detail the functions and responsibilities of the Chief ASMRO. In brief these functions and responsibilities cover (1) the obtaining of necessary bed availability reports from medical facilities of the Armed Forces; (2) the control of the flow of patients; (3) the development of adequate liaison with transport agencies; (4) the collection and analysis of medical evacuation requirements; (5) the development

## ORGANIZATIONAL CHART

## ARMED SERVICES MEDICAL REGULATING OFFICE

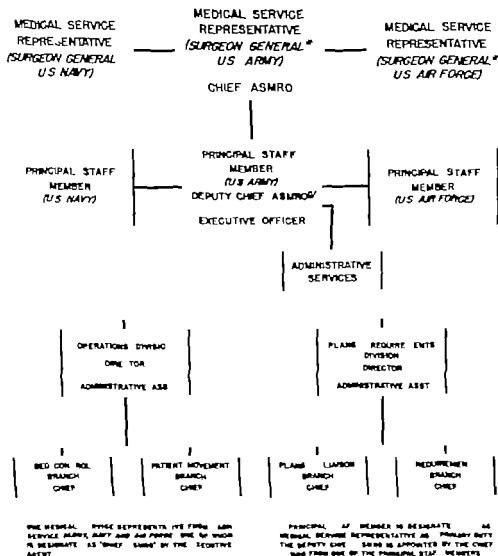


Figure 1

of appropriate plans to improve patient evacuation procedures and (6) the initiation of recommendations on doctrine and policy procedures to be followed in the issuance of patient movement directives.



On 1 April 1951 the Department of the Navy issued appropriate directives which brought the flow of naval and marine patients under ASMRO cognizance.

ASMRO is a patient-movement-control agency and not an agency formed to impress medical operational policy on the medical services of the three military departments. Rather it is a joint military office working in close liaison with the operations personnel of the offices of each of the three Surgeons General and each transport agency in order that a steady, uniform, controlled flow of patients into the hospitals of the Armed Forces may be effected. This control has recently been extended to include the movement of military patients into appropriate hospitals of the Veterans Administration. Properly to effect complete patient movement control efficient use of all media of transportation is necessary. This facet of operations is being covered by complete liaison with the Chief of Transportation, Department of the Army and through him, with the Military Air Transport Service, the Military Sea Transport Service and the Association of American Railroads.

For the future, ASMRO has many projects. Recommendations pertaining to the entire field of patient-movement directives are being formulated. The problems inherent in prompt and efficient communication from debarkation hospitals to ASMRO are to be studied. Standardization and improvement in the entire field of patient debarkation and processing are needed. Mobilization plans of the three services pertaining to patient evacuation are to be reviewed. Additional standardization, in the interest of the most economical use of the total military hospital potential will be sought in connection with medical regulating activities.

# About the Army Medical Service

## The New Army Interns and Residents

Charles H. Gingles *Colonel, MC U S A (1)*

ON 1 July 1951 137 interns and 73 residents who were selected by the Department of the Army for entry into or continuance in professional training commenced that training in named Army hospitals. As in past years the selection of the interns was effected by a committee designated by the Surgeon General for that purpose and the selection of residents was accomplished by the Professional Education Committee of the Office of the Surgeon General.

This year 520 applicants representing 60 medical schools approved by the American Medical Association were considered for the internship appointments. Because of the limited number of internships available it was not possible to approve all of these even though many of those who were not selected unquestionably would have contributed materially to the Army Medical Service. In the selection of interns special consideration was given to those applicants who either were enrolled in the Medical Reserve Officers Training Corps program, or were veterans and to those who indicated a sincere interest in a military medical career. Selected applicants were tendered appointments in accordance with the Cooperative Plan for Appointment of Interns as adopted by the Association of American Medical Colleges, the American Medical Association, the American Hospital Association, the American Protestant Hospital Association and the American Catholic Hospital Association. Those who accepted and subsequently commenced their internship training were appointed first lieutenants in the Medical Corps Reserve. As officers on active duty they will receive the pay and allowances of that grade during their training period. Analysis of the background of the new Army interns reveals that 115 had prior military service. 7 held commissions in the Medical Service Corps, 36 others held Reserve commissions in the Navy, Air Force and National Guard or other corps of the Army Reserve. Two of the new interns had

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(1) Personnel Division, Office of the Surgeon General, Department of the Army

advanced to the grade of major and 14 others to the grade of captain. All in all it may be seen that this year's interns are military men and officers of whom the Army Medical Service can be proud.

The training these interns will receive is being conducted in 11 named Army hospitals. Seven of these hospitals (Brooke Army Hospital, San Antonio, Tex., Fitzsimons Army Hospital, Denver, Colo., Letterman Army Hospital, San Francisco, Calif., Madigan Army Hospital, Tacoma, Wash., Tripler Army Hospital, Honolulu, T. H., Walter Reed Army Hospital, Washington, D. C., and William Beaumont Army Hospital, Fort Bliss, Tex.) conducted internship training programs during the past year. This year internship training is also being conducted at Army and Navy General Hospital, Hot Springs, Ark., Murphy Army Hospital, W. H. Ham, Mich., Percy Jones Army Hospital, Battle Creek, Mich., and Valley Forge Army Hospital, Phoenixville, Pa.

The Army internship program has been so designed that it fully meets the requirements of the Council on Medical Education and Hospitals of the American Medical Association. It is executed under the direction of physicians both military and civilian who are outstanding professionally and eminently qualified as teachers. The program utilizes modern fully equipped laboratories and medical, surgical, and radiologic facilities. Each of the teaching hospitals possesses abundant and varied clinical material which permits excellent training opportunities. The internships are of the rotating type and will afford to all participants a well-rounded exposition to the field of military medicine. In general the duties of the intern will correspond to those performed in civilian hospitals and there will be ample opportunity for the discussion of problems they present themselves.

In the past the Army intern has constituted a sizeable percentage of those officers commissioned into the Regular Army. It is hoped this year that the comparable percentage will be the highest ever. This optimism is based on the fact that this is the first group of military interns who as a group will serve on active duty at least one year immediately after their internship training. This specified period of service has been introduced as the result of an agreement between the armed services which was incorporated as a policy of the Secretary of Defense. It is believed that this greater period of participation in military medical activities will better acquaint these new medical officers with the opportunities afforded by a career in Army medicine.

To those who desire to apply for Regular Army appointment at the earliest date the opportunity will be extended after they complete 8 months of training. The commanding officer at their hospital will tender them this opportunity and he will be readily available to furnish any information and guidance the intern might desire. Time and experience alone will determine how well-founded is this optimism.

The number of residents who were selected for entry into or continuance in professional training this year was less than usual because

the Army Medical Service is fulfilling its commitment to those officers whose training was temporarily interrupted by service in the Korean war. These officers were permitted to re-enter their residencies with the knowledge that the Army Medical Service is truly proud of their performance.

Those officers who were selected for training this year met the criteria established in a policy of the Secretary of Defense. Under this policy, primary consideration was given to those Regular Army officers who had completed at least 2 years of commissioned service subsequent to their internship. Officers serving in all parts of the world were considered, and those selected who were serving overseas were returned to the United States in time to commence their training on 1 July. The controlling factor was not, however, the amount of commissioned service, but rather the manner of performance of duty and the number to be selected for training in a given specialty.

Certain of the officers selected for residency training had only recently completed their internships, but others had up to 8 years of military service, including duty in other branches. Here again, as in the intern program, it may be seen that military men who manifested an interest in a military medical career comprised the training personnel. The training this year's newly selected residents will receive is being conducted in four named Army hospitals: Brooke, Fitzsimons, Letterman, and Walter Reed. The training program has been so designed that the training in each specialty is fully creditable toward attaining certification by an appropriate American specialty board. This training, like the internship training program, is conducted by military and civilian physicians eminently qualified in their fields. The nature of the facilities in which the residents train and the quality of the available clinical material assures the resident an opportunity to attain the knowledge and proficiency desired.

It is hoped that it will not be necessary to interrupt the training of residents this year for duty overseas. It is also hoped that the coming years will permit a greater number to be selected for professional training. It is significant, though, that most of the officers whose training was interrupted last year and who acquired experience overseas returned to training with a much more mature outlook than they had when they left. Consequently, they should be better able to benefit from their training. This was particularly true of the officers who served with troops in combat. Many of the officers selected for training this year are also fortunate in having had similar experience.

It should be understood that our medical officers in professional training are military men—men who have demonstrated by military service that they desire to contribute to the advancement of the Army Medical Corps. A list of the officers selected as interns and residents for training this year follows. We all wish them continued success in their military medical career.

TABLE 1—Army interns

Name	Medical school	Hospital of internship
Abrahamson, Edwin H.	Jefferson Medical College	V. B. Forge
Agnew, Paul C.	McGill University	Madigan
Aiken, Robert E.	University of Southern California	Tripler
Akret, Joseph D.	University of Illinois	Fitzsimons
Allen, Leven J.	University of Pennsylvania	Madigan
Anderson, Robert V.	Jefferson Medical College	Walter Reed
Anderson, Edgar H.	University of Wisconsin	Tripler
Aperle, Robert S.	University of Pennsylvania	Walter Reed
Babin, Silas, Jr.	Louisiana State University	Walter Reed
Bailey, Henry W.	University of Georgia	Brooks
Best, Andrew A.	McHenry Medical College	Madigan
Betts, Charles S.	Vanderbilt University	Brooks
Brasher, Burton F.	University of Utah	Tripler
Brown, Kenneth P.	Tulane University	Brooks
Burkhalter, E. ell R.	Louisiana State University	Brooks
Callas, Stanley D.	University of Oregon	V. B. Forge
Carroll, Thomas M.	Western Reserve University	Tripler
Candler, Harold V.	State University of Iowa	Letcher
Chen, Wallace L.	Stanford University	Tripler
Claypool, Harry A.	Western Reserve University	Brooks
Clements, Richard O.	Baylor University	Brooks
Conner, Bradley T.	Syracuse University	Tripler
Cone, William H.	University of Oregon	William Beaumont
Connolly, John R.	Loyola University	Fitzsimons
Cooper, David S.	Columbia University	Brooks
Cory, Paul E.	Western Reserve University	Madigan
Cupp, Claude M.	Emory University	Tripler
Curtis, Gerald R.	Tulane University	Fitzsimons
Cutshall, Vincent K.	University of Colorado	Fitzsimons
Davis, Thomas D.	Louisiana State University	Walter Reed
Davis, William E.	Columbia University	William Beaumont
Dennis, Francis E.	University of Minnesota	Tripler
Denary, Ernest E.	Emory University	Percy Jones
Dorst, Abraham L.	Loyola University	Walter Reed
Edwards, George D.	Georgetown University	Letcher
Ellis, Jacob P.	University of Arkansas	Walter Reed
Eisenstein, Thoma S., Jr.	University of Kansas	Madigan
Feisley, Robert E.	University of Kansas	Brooks
Ferry, Francis A.	St. Louis University	Madigan
Fischer, Barton L.	University of Kansas	Tripler
Foley, George P.	Tufts College	Letcher
Forsman, Freeman P.	University of Colorado	Fitzsimons
Gibbs, Raymond W.	New York Medical College	Walter Reed
Glover, Daniel H. G.	University of Georgia	Letcher
Goodman, Lovell L.	Yale University	Percy Jones
Goodman, Raymond C.	University of Arkansas	William Beaumont
Goss, George F.	University of Georgia	Brooks
Gummel, Gilbert C.	University of Texas	Brooks
Hardie, Philip W. J.	University of Wisconsin	Tripler
Hartley, Thomas F.	University of Arkansas	Madigan
Hawes, Charles F.	Jefferson Medical College	Walter Reed
Hays, David	Harvard Medical College	Walter Reed

TABLE 1—*Army Interns*—Continued

Name	Medical school	Hospital / Internship
Hayes, Donald M.	Syracuse University	Walter Reed
Hemigues Charles C.	University of Oregon	Brooks
Hooper Curtis C., Jr.	Baylor University	Letterman
Horne Francis G.	Duke University	Brooks
Houck, Leroy R.	University of Michigan	Murphy
Howard William R.	Emory University	Brooks
Hudson, George C.	Baylor University	Brooks
Handle J hn F.	University of Colorado	Letterman
Jones Wilton N.	University of Ohio	Letterman
Kitchens Daniel G., Jr.	University of Georgia	Army & Navy
Kraeger Harold P.	University of Buffalo	Walter Reed
Ladinsels Clifford C.	University of Wisconsin	Brooks
LeBeau, George L.	Louisiana State University	William Beaumont
Lee, Philip J W.	Creighton Medical School	Walter Reed
Leigh, Bert G.	University of Illinois	Letterman
Leonard, Glenn R.	Jefferson Medical College	Fitzsimons
Leopold, Jonathan P A.	University of Buffalo	Walter Reed
Leroy Alvin G.	Loyola University	Fitzsimons
Lewis Robert L.	University of Arkansas	Army & Navy
Locke Robert V.	Syracuse University	Walter Reed
Major Robert	University of Georgia	Madigan
Martin, Raymond G.	University of Oregon	Madigan
Mattigly Thomas E J.	George Washington University	Walter Reed
McMillen, Stephen D.	University of Arkansas	Army & Navy
McCaleb Foster C., J.	Tulane University	Walter Reed
McKeown, Eugene P.	Georgetown University	Walter Reed
Mendis Christopher L.	Tulane University	Madigan
Mitchell, John P J.	Tulane University	Brooks
Moak, Benjamin F., J.	Baylor University	Madigan
Mortenson, Howard O.	University of Minnesota	Tripler
Nashkin Donald T.	University of Nebraska	Tripler
Nash, Denning A.	University of Georgia	Brooks
Nolan, John E.	Syracuse University	Fitzsimons
Onstead, Charles O., J.	Southwestern Medical College	Brooks
Pate, Merl C.	University of Michigan	Fitzsimons
Parapid Nicholas V.	Duke University	William Beaumont
Pearson, Walter C.	Wayne University	Murphy
Power John R.	University of Arkansas	Army & Navy
Railsback, George J.	Baylor University	Brooks
Ritchford Lawrence A.	St. Louis University	Fitzsimons
Reed Allen M.	Tulane University	Letterman
Richardson Jam P.	Temple University	Walter Reed
Richardson William W.	Tulane University	William Beaumont
Roberts Grosvenor G.	University of Kansas	Letterman
Robertson, William D.	University of California	Letterman
Ryder, Gilbert S.	University of Nebraska	Madigan
Sawyer William C., Jr.	University of Oklahoma	Letterman
Schoonmaker Joseph H.	University of Colorado	Tripler
Schwartz Mervin L.	Temple University	Fitzsimons
Sebastian, Eugene	Temple University	Murphy
Seifert, Thomas E.	University of Pittsburgh	Walter Reed
Shankel Lewis V.	University of Virginia	William Beaumont

TABLE 1.—Army interns—Continued

Name	Medical school	Hospital of internship
Sheer, Thomas W. _____	Syracuse University _____	Brooks
Shuler, Harold E. _____	Baylor University _____	Brook
Sieger, Joseph P. _____	Temple University _____	Fitzsimons
Shuman, James B. _____	Baylor University _____	Letterman
Silverberg, Joseph E. _____	Tufts College _____	Murphy
Shumans, James C. _____	University of Arkansas _____	Walter Reed
Sims, Charles E. _____	University of Washington _____	Madigan
Slaughter, Manuel O. _____	University of Arkansas _____	William Beaumont
Slomkowski, Victor J. _____	Wash. University _____	Percy Jones
Smith, Joe C. _____	Baylor University _____	Brooks
Socha, Eugene M. _____	Marquette University _____	Percy Jones
Swain, Edward B. _____	Cornell University _____	Walter Reed
Somers, Perry O. _____	Bowman Gray _____	Fitzsimons
Suzzy, Robert W. _____	State University of New York _____	Fitzsimons
Sweeney, Vincent C. _____	University of Oregon _____	Letterman
Thicksten, Jack M. _____	University of Arkansas _____	Madigan
Tidd, Harmon O. _____	Western Reserve University _____	Brooks
Tiller, Ralph E. _____	Tulane University _____	Fitzsimons
Toland, William J. _____	University of Arkansas _____	Walter Reed
Tobeson, William J. _____	University of Arkansas _____	Brooks
Turner, Harold T. _____	Medical College of Virginia _____	Brooks
Turner, John C. _____	Tulane University _____	Walter Reed
Uhlis, Henry T. _____	New York Medical College _____	Valley Forge
Vanderwever, Nicholas W. _____	Columbia University _____	Walter Reed
W. Rar, William W. _____	Emory University _____	Fitzsimons
Wales, Spencer _____	Tulane University _____	Madigan
Wase, Eugene L. _____	University of Massachusetts _____	Troyer
Walbourne, George R. _____	Baylor University _____	Brook
Williams, Harold L. _____	Duke University _____	William Beaumont
Williams, Louis H. _____	Duke University _____	William Beaumont
Yeat, Robert A. _____	University of Texas _____	William Beaumont
Yount, Arthur W. _____	Bowman Gray _____	Letterman
Zerns, Charles J., Jr. _____	Marquette University _____	Madigan

TABLE 2.—Army residents

Specialty	Resident Name	Physician		Army hospital		Army Read		Tubing level
		Name	Tubing level	Name	Tubing level	Name	Tubing level	
Anesthesiology	Crippen, Captain William F.	AR				Shirley, Lieutenant Timothy G.	AR	
Cardiology						Odell, Captain Lewis E. J.	AR	
Dermatology	Kidd, Captain Ira V.	SR		Franklin, Major Robert D.		Odell, Captain Lewis E. J.	AR	
General surgery	McIntosh, Major Terrell	AR		Hopman, Lieutenant Alvin R. Carrigan, Major America J. Walsh, Captain Richard A.		Odell, Captain Lewis E. J.	AR	
Internal medicine	Evans, Lieutenant James A.	AR		Lumpkins, Lieutenant P. H. Taylor, Captain Richard R.		Seward, Major Donald J.	AR	
Obstetrics and gynecology	Michelson, Major Robert V.	R				Holt, Captain Lewis E.	AR	
Ophthalmology	Pearson, Major Jack W.	AR				Seward, Major Donald J.	AR	
Otolaryngology	Phillips, Captain William G. Van Gabel, Lieutenant Lewis A. and, Captain Richard A.	AR AR AR				Holt, Captain Lewis E.	AR	
Otolaryngology	Lumpkins, Captain John P. Luttrell, Major Robert E.	R SR		Evans, Lieutenant Paul W. Sellers, Lieutenant Thomas D.		Odell, Captain Lewis E.	AR	
Otolaryngology	Wells, Captain John H., Jr. Joseph, Captain Donald J.	R R		Shirley, Lieutenant James L.		Odell, Captain Lewis E.	AR	





## BOOKS RECEIVED

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**Gynecologic Cancer**, by *James A. Corcoran*, Ph. B., M. D., Professor Emeritus of Clinical Gynecology College of Physicians and Surgeons Columbia University Attending Gynecologist, Sloane Hospital for Women, New York N. Y. Thomas Nelson & Sons New York N. Y. publisher, 1951 Price \$6.

**Symposium on Steroids in Experimental and Clinical Practice** edited for the *Committee on Arrangements* by *Abraham White* 415 pages; illustrated. The Blakiston Co. Philadelphia, Pa., publisher, 1951 Price \$7.50.

**Clinical Tropical Medicine**, R. B. H. Gradwohl, M. D., Editor-in-Chief; *Luis Benitez Soto*, M. D., and *Oscar Felszfeld*, M. D. Editors. 1647 pages; 473 illustrations and 6 color plates. The C. V. Mosby Company St. Louis Mo publisher, 1951 Price \$22.50

**Human Physiology** by *Bernardo A. Houssay* M. D. Professor of Physiology Director of the Institute of Biology and Experimental Medicine Buenos Aires, Argentina *Jaime T. Lewis* M. D., Professor of Physiology Director of the Institute for Medical Research, Rosario Argentina, *Oscar Orfao* M. D. Professor of Physiology; Director of the Mercedes and Martin Fereyra Institute for Medical Research, Córdoba, Argentina, *Eduardo Braun Menéndez*, M. D., Professor of Physiology Member of the Institute of Biology and Experimental Medicine, Buenos Aires Argentina; *Enrique Hug*, M. D., Professor of Pharmacology of the School of Medicine Rosario Argentina; *Virgilio G. Foglia*, M. D., Professor of Physiology Member of the Institute of Biology and Experimental Medicine, Buenos Aires, Argentina and *Luis P. Lolot* M. D., Director of the Institute for Biochemical Research, Campomar Foundation, Buenos Aires Argentina. Translated by *Jaime T. Lewis* M. D., and *Oliver T. Lewis* with a foreword by *Herbert M. Evans* M. D. 1117 pages, illustrated. McGraw-Hill Book Co. Inc. New York, N. Y., publisher 1951 Price \$14

**The 1950 Year Book of Physical Medicine and Rehabilitation** (December 1949-January 1951), edited by *Frank H. Krusen*, M. D. Professor of Physical Medicine, Mayo Foundation Head of the Section on Physical Medicine and Rehabilitation Mayo Clinic Associate Editors: *Earl C. Elkins* M. D., Assistant Professor of Physical Medicine Mayo Foundation Consultant in Physical Medicine and Rehabilitation Mayo Clinic, and *George G. Denver* M. D., Professor of Clinical Rehabilitation and Physical Medicine New York University College of Medicine Director of the Department of Physical Medicine and Rehabilitation Bellevue Hospital. 328 pages, illustrated. The Year Book Publishers, Inc., Chicago Ill., publisher, 1951 Price \$5.

**Hypoidal Psychotherapy** by *Margaret Steger* Ph. D., Foreword by *Frederic Bergstrom*, M. D. 150 pages. Froben Press, Inc. New York N. Y., publisher 1951 Price \$3.50

**Diseases of the Heart and Circulation** by *Paul Wood*, O. B. E., M. D. (Melbourn), F. R. C. P. (London), Director Institute of Cardiology London; Physician, National Heart Hospital, Physician in charge of the Cardia Department, Brompton Hospital, Cardiologist, Rheumatic Fever Unit, Canadian Red Cross Memorial Hospital, T. plow; Late Consulting Cardiologist Postgraduate Medical School of London, Hammersmith Hospital. 389 pages illustrated. J. B. Lippincott Co., Philadelphia, Pa. publishers 1950. Price \$12.50.

**A Textbook of Medicine**, edited by *Russell L. Cecil* M. D., Sc. D., Professor of Clinical Medicine Emeritus, Cornell University New York and *Robert F. Leeb* M. D., Bard Professor of Medicine Columbia University New York. Associate editors *Alexander B. Gutman*, M. D. Professor of Medicine Columbia University New York *W. Leeb McDermott*, M. D. Associate Professor of Medicine Cornell University New York, and *Harold G. Wolff* M. D. Associate Professor of Medicine (Neurology), Cornell University 8th edition 1627 pages, illustrated. W. B. Saunders Co., Philadelphia, Pa. publishers, 1951 Price \$12.

**Clinical Heart Disease** by *Samuel A. Levine* M. D., F. A. C. P., Clinical Professor of Medicine Harvard Medical School, Physician, the Peter Bent Brigham Hospital, Boston; Consultant Cardiologist, Newton-Wellesley Hospital, Physician New England Baptist Hospital. 4th edition. 556 pages illustrated. W. B. Saunders Co. Philadelphia, Pa. publishers 1951 Price \$7.75

**Oral Physiology** by *John T. O'Rourke* B. S., D. D. S., Sc. D. Edited by *Leroy M. S. Mixer* M. D., D. D. S., Sc. D., Dr. P. H. Boston 333 pages. The C. V. Mosby Co. St. Louis Mo., publishers 1951 Price \$5

**A History of Neurological Surgery** edited by *A. Earl Wilker* M. D., Professor of Neurological Surgery The Johns Hopkins University Contributors *William J. Atkinson*, *Kenneth M. Browne*, *John V. Crawford*, *Robert G. Fisher*, *Robert E. Green*, *Herbert C. Johnson*, *James Markham*, *Curtis Marshall*, *Desmond C. O'Connor*, *W. Eugene Stern*, *Alfredo F. Thompson*, *A. Earl Wilker* Editorial Committee *Robert E. Green*, *Herbert C. Johnson*, *W. Eugene Stern*. 583 pages; illustrated. The Williams & Wilkins Co., Baltimore Md. publishers 1951 Price \$12

**Oral Rehabilitation, Complete Occlusal Reconstruction Treatment of Dental Deformities and Related Subjects The Closed Bite** by *Jerome M. Schweitzer* B. S., D. D. S., Consulting Dental Surgeon, Vassar Hospital, New York City; Postgraduate Instructor in Prosthodontics, First District Dental Society New York City Associate Fellow New York Academy of Medicine Fellow American Academy of Dental Medicine 1161 pages with 1157 illustrations The C. V. Mosby Co. St. Louis, Mo. publisher 1951 Price \$20

**A Text-Book of X-ray Diagnosis** by British Authors in Four Volumes Edited by *S. Cochrane Shanks*, M. D., F. R. C. P. F. F. R. Director X-ray Diagnosis Department, University College Hospital, London and *Peter Kerley* M. D., F. R. C. P. F. F. R., D. M. R. E., Director X-ray Department, Westminster Hospital Radiologist, Royal Chest Hospital, London. 2d edition, Volume II. 702 pages 605 illustrations W. B. Saunders Co., Philadelphia Pa. publishers, 1951 Price \$15

**Clinical Electrocardiography** by *Aubrey Graybiel*, Captain, MC, USN Director of Research, U. S. Naval School of Aviation Medicine Pensacola Fla. 198 pages illustrated Thomas Nelson & Sons, New York N. Y. publisher, 1951 Price \$5

- Anesthesia in Dental Surgery** by *Sterling V. Mead*, D. D. S., M. S., B. S., F. A. C. D. 2d edition. 648 pages, with 212 illustrations. The C. V. Mosby Co. St. Louis Mo., publisher 1951. Price \$12.50.
- Clinical Laboratory Methods** by *W. E. Bray*, B. A., M. D., Professor of Clinical Pathology, University of Virginia, Director of Clinical Laboratories, University of Virginia Hospital. 4th edition. 614 pages with 119 text illustrations and 18 color plates. The C. V. Mosby Co. St. Louis Mo. publisher 1951. Price \$7.25.
- Diabetes Insipidus** by *Harry Blotner*, M. D., Associate Visiting Physician, Beth Israel Hospital, Boston, Mass. Edited by *Henry A. Christian*, A. M., M. D., LL. D., Sc. D. (Hon.), M. A., C. P., Hon. F. R. C. P. (Can.), D. S. M. (A. M. A.), Hersey Professor of the Theory and Practice of Physic, Emeritus, Harvard University; Sometime Clinical Professor of Medicine, Tufts College Medical School; Sometimes Visiting Physician, Beth Israel Hospital; Sometime Physician-in-Chief, Emeritus, Peter Bent Brigham Hospital, Boston, Mass. (Reprinted from Oxford Loose-Leaf Medicine with the same page number as in that work.) 206 pages, illustrated. Oxford University Press, New York, N. Y. publisher 1951. Price \$4.50.
- Handbook of Nutrition**, A Symposium prepared under the auspices of the Council on Foods and Nutrition of the American Medical Association. 2d edition. 717 pages. Published for American Medical Association. The Blakiston Co. Philadelphia Pa. publisher 1951. Price \$4.50.
- Emotional Factors in Cardiovascular Disease** by *Edward Weiss*, M. D., Professor of Clinical Medicine, Temple University School of Medicine, Philadelphia, Pa. Publication Number 97, American Lecture Series. A Monograph in American Lecture in Circulation. 84 page. Charles C. Thomas Publisher, Springfield, Ill. 1951. Price \$2.25.
- Syllabus of Human Neoplasms** by *R. M. Malligen*, M. D., Professor of Pathology in the University of Colorado School of Medicine. 317 pages, with 230 illustrations. Lea & Febiger, Philadelphia, Pa. publisher 1951. Price \$7.50.
- The 1950 Year Book of Endocrinology** (January 1950-January 1951), edited by *Willard O. Thompson*, M. D., Clinical Professor of Medicine, University of Illinois College of Medicine, Attending Physician (Senior Staff), Heurortin Hospital, Attending Physician, Grant Hospital of Chicago. 499 pages, illustrated. The Year Book Publishers, Inc. Chicago, Ill. publisher 1951. Price \$5.
- The Bender-Gestalt Test: Quantification and Validity for Adults** by *Gerald R. Pascal*, Ph. D., Research Psychologist, Western Psychiatric Institute and Clinic; Associate Professor of Psychology, University of Pittsburgh; and *Barbara J. Suttell*, M. S., Assistant Research Psychologist, Western Psychiatric Institute and Clinic. Foreword by *David G. Wright*, M. D. 274 pages, illustrated. Grune & Stratton, New York, N. Y. publisher 1951. Price \$6.50.
- Post-Graduate Lectures on Orthopedic Diagnosis and Indications** by *Arthur Stindler*, M. D., F. A. C. S., Professor of Orthopedic Surgery, State University of Iowa, Iowa City, Ia. Volume II, Section A, Paralytic Disabilities, Section B, Static Disabilities. 198 pages, illustrated. Charles C. Thomas, Publisher, Springfield, Ill. 1951. Price \$6.

**Ambulation Physical Rehabilitation for Crotch Walkers** by *Kenneth A. Dentig*, B. S. M. Ed. and *Frank S. Deyou J.*, B. S. Instructor-Supervisors Corrective Therapy Cushing Veterans Administration Hospital, Framingham, Corrective Therapists at Boston City Hospital, Boston, and Medford Ambulation Clinic at Medford, in Massachusetts, and *Alfred B. Ellison*, B. S., Chief, Corrective Therapy Cushing Veterans Administration Hospital, Framingham, Corrective Therapist at Boston City Hospital, Boston, and Medford Ambulation Clinic at Medford in Massachusetts. 183 pages; illustrated. Funk and Wagnalls Co. New York, N. Y., publisher 1951 Price \$3.50.

## BOOK REVIEWS

**The Ethical Basis of Medical Practice** by *Willard L. Sperry* Dean of the Harvard Divinity School with a foreword by *J. Howard M. Ans* M. D. 185 pages. Paul B. Hoeber Inc., New York, N. Y. publishers 1950. Price \$2.50

Dean Sperry very capably attempts to marry medicine and theology. Although from the medical viewpoint this is proper, it is still difficult for the physician to forget the centuries during the dark ages when he had to accomplish his researches in dark cellars and cold attics, fearful that the powerful political forces of religious bodies might catch him in the act of studying human anatomy on a dead body. For such an offence he might be tortured on the rack and killed. Although after 500 years we are still wary of overture from religious sources, we recognize the need in all humanity for the doctor and the minister. These needs overlap. Both professions could do better work through mutual trust and cooperation. The question that I do not feel capable of answering is how to develop this cooperation and annihilate the distrust. Dean Sperry develops this thesis. I spent 5 months reading the first 75 pages of this book yet I read and reread the last 100 pages in one night. I would suggest that any doctor who reads this book read Chapter 8 first in order to get interested. He will then study the rest of this serious work of a learned man. It is not for the casual reader but should be read by any who aspire to leadership in medicine.

—Commander W. F. Lyons MC USN

**Essentials of Urology** by *J. C. Aburnworth-Davis* M. A. M. D., B. CH. (Cant.), F. R. C. S. (Eng. and Edin.), Urological Surgeon, The Bellingbroke Hospital London, Visiting Urologist, Kettering and District General Hospital and the Lord Mayor Treloar's Hospital, Alton. Hon. Consulting Urologist, Royal Waterloo Hospital London, Lt. Wing-Commander i/c Surgical Division, Royal Air Force Medical Service Secretary to Council Royal Society of Medicine. 734 pages illustrated. Charles C. Thomas, Publisher, Springfield, Ill. 1950. Price \$10

This clear concise textbook contains few drawings, but those which have been included are excellent. It reflects the author's wide experience in military as well as civilian practice. The discussion of the treatment of bladder and renal injuries is excellent. There may be some criticism of the evaluation of aberrant anal canal and the treatment of hydronephrosis. Sections on the clinical diagnosis of urologic lesions are thorough and complete. For a one-volume text, the discussion of radiography and operative procedure is detailed and excellent, but there is little discussion of basic physiology, metabolism, and endocrinology as applied to urology or urologic conditions in children. Early postoperative ambulation is well understood in this country is not stressed. The discussion of the treatment of carcinoma of the prostate is rather preliminary.

There is a successful effort throughout the volume to present in detail the essential practical and simple techniques, both for diagnosis and treatment, available to the urologist. Thus the omission of a more detailed discussion of

th modern treatment of oliguria and anuria is surprising, but the essentials of urology are fully covered, and the author draws from his personal experience for practical suggestions which are most helpful.

—Lt. Col. R. W. Satterthwaite MC, U. S. A.

**Skull Fractures and Brain Injuries**, by Harry E. Mook, M. D., Consulting Surgeon, St. Luke Hospital, Chicago; Associate Professor Emeritus of Surgery Northwestern University Medical School Chicago. 806 pages; illustrated. The Williams & Wilkins Co., Baltimore Md., publisher, 1950. Price \$13.50.

"Theoretically acute head injuries are within the domain of the neurosurgeon. The magnitude of the problem is such, however, that for practical reasons most such injuries cannot be treated by specialists in this field. They will probably remain so until they are at this time, the responsibility of general surgeons and even of general practitioners. This statement of an early neurosurgeon, quoted by the author, expresses the basic thought behind this comprehensive study encompassing over 50 years of treating head injuries. The book should be of inestimable value to the Navy surgeon, who may frequently be called on to manage these cases by himself during the critical period of illness. Controversial ideas and teaching over the years are analyzed in the light of results obtained, with the fundamental aim of reducing the mortality rate. Nearly 8,000 cases of proved skull fractures provide the basis for this ready-to-hand proved fracture formulae—uniform measure with which to compile and standardize and compare treatments.

The text is easily readable, well organized, and liberally sprinkled with case histories and illustrations. Many instances of mistakes in management, as well as successfully treated cases contribute to the establishment of sound, life-saving principles. Osseous and intracranial lesions and functional disturbances are extensively discussed. Diagnostic signs and symptoms are analyzed on the basis of over 2,500 case records. Of special interest and value are the chapters on prognosis, general principles of treatment, medical management, operative treatment, and posttraumatic syndromes.

—Lt. F. W. Meyer J MC, U. S. N.

**Psychosurgery in the Treatment of Mental Disorders and Intractable Pain**, by Walter Freeman, M. D., Ph. D. F. A. C. P., Professor of Neurology George Washington University Washington, D. C., and Jane W. Watts M. D. F. A. C. S. F. L. C. S., Professor of Neurological Surgery George Washington University Washington, D. C. 2d edition. 598 pages; illustrated. Charles C. Thomas, Publisher Springfield Ill. 1950. Price \$10.50.

This book is one of the most valuable collections of cases of prefrontal lobotomy published to date. This operation is completely discussed from its indications to extensive follow-up studies. Nowhere else have 10- to 13-year follow-ups of lobotomized patients been published. Nevertheless the book contains much controversial material and readers of psychosurgery will agree with all of the interpretations presented by the authors. The chapters on pain and on the pathology of the prefrontal lobotomy are most informative. The surgical technique of this operation is described. The surgical anatomy is discussed and roentgenograms showing the operative changes by lipiodol are presented. The last 8 chapters are of special interest to the psychiatrist, and the material offered will be appreciated by physicians who want to know when psychosurgery will be of benefit to their patients. Throughout the book there are numerous illustrations, but the outstanding feature is the collection of descriptive, illuminating, and complete case histories. Transorbital lobotomy procedure which does not appeal to the neurosurgeon

and is contradictory to every surgical fundamental known to this reviewer as discussed. Other techniques of psychosurgery such as gyrectomy, topectomy, cortical undercutting and thalamotomy are briefly mentioned. The value of this book lies in its collection and documentation of pioneer work which can serve as a working basis for continued study of the lobotomized patient. It offers certain theories and interpretations which even though they may not be acceptable to all will be a stimulus to the student.

—L. L. Combs, G. Clark, MC, U. S. N.

**The 1950 Year Book of Urology** (October 1949–October 1950) edited by *William Wallace Scott, M. D., Ph. D.*, Director *James Buchanan*, Brady Urological Institute, The Johns Hopkins Hospital, Urologist-in-Charge, The Johns Hopkins Hospital, Professor of Urology, The Johns Hopkins University School of Medicine. 416 pages; illustrated. The Year Book Publishers Inc. Chicago Ill. publishers 1950.

This book should be in every urologist's library. The introduction covering the decade 1940 to 1950 impresses one with the advances in diagnostic technique and therapeutic procedure many of which we accept and use without thought as to the process of development. The survey of the literature for the year is comprehensive world-wide in its scope and would be extremely difficult for the average physician to acquire through his own reading. The arrangement of the book is excellent, permitting easy use for reference purposes. The material although abbreviated is exceedingly well presented.

—Col. C. C. Dodson, MC, U. S. A.

**Atlas of Histologic Diagnosis in Surgical Pathology** by *Karl T. Neuberger, M. D.*, Professor of Pathology, University of Colorado School of Medicine, Denver, Colo., with a section on Exfoliative Cytology by *Walter T. Winkler, B. S., M. S., M. D.*, Assistant Professor of Pathology, University of Colorado School of Medicine, Denver, Colo. Photography by *Glenn E. Mills, B. A., M. A.*, Department of Visual Education, University of Colorado School of Medicine, Denver, Colo. 460 pages, illustrated. The Williams & Wilkins Co., Baltimore Md., publisher, 1951. Price \$11.

In this atlas the author endeavors to meet the needs of residents, senior medical students and physicians who are preparing for specialty boards. The book consists essentially of 880 black and white photomicrographs, each with the diagnosis in large type and accompanied by a brief description of the microscopic features and pertinent clinical and gross pathologic findings. Frequently areas from low-power fields are shown in higher magnification for greater detail. The presentation is by systems beginning with the skin and subcutaneous tissues and ending with the eye and ear. A section on exfoliative cytology is included. The bone marrow has been purposely omitted, belonging more to the clinical pathologist rather than to the tissue pathologist. The better known standard texts consulted are listed alphabetically in the preface. The histologic material depicted was largely derived from the surgical excisions of the Colorado General Hospital as well as from the author's own extensive slide file collected over 25 years.

No single atlas of this kind could be expected to depict all pathologic entities, and this one is no exception. There are definite gaps and as missing entities are not mentioned because of lack of textual material, they could be entirely ignored by the student who rested heavily on this text for review study material. In general, the illustrations are good and depict the lesions described. Some of the lower magnifications, however, lack sufficient detail to be of value. The accompanying legends in many cases could well have given more detail pertinent to the illustrations as there is adequate space on



almost every page for it. In many cases the meager description gives the reader little indication of the nature of the lesion. In pathology illustrations, however good, depend on adequate descriptive legends to be of maximal value, especially for those who do not specialize in the field concerned. Some of the diagnostic titles given are not in general use and could be considered controversial.

Whether the medical student or physician who studies pathology sporadically could gain much from this atlas is problematical, and for the trained pathologist it seems too superficial.—*Capt. W. M. Silbphart, MC, U. S. N.*

**Anopheles and Malaria in the Near East, Anophelia Survey in Syria and Lebanon**, by H. S. Leeson, F. R. E. S., Major, R. A. M. C., *Anophellum and Malaria in Transjordan and in the neighboring parts of Palestine and Syria*, by W. H. R. Lumsden, B. Sc., M. B., Ch. B., D. T. M. and H., Lt. Col., R. A. M. C., and J. Yofe, M. D., D. T. M., Lt. Col. R. A. M. C., *The Anophelia Mosquitoes of Iraq and North Persia* by T. T. Macna, M. A. Ph. D., F. R. E. S., Major, R. A. M. C. Introduction by Professor P. A. Burton, C. M. G., F. R. S. 223 p. gen.; illustrated. H. K. Lewis & Co., Ltd., London, publishers, 1950. Price 35s. net.

Much valuable information concerning *Anopheles* and malaria is presented in this book. In three sections were written separately and thus differ somewhat in form and content. Each contains an excellent account of the geography, climatology and distribution of *Anopheles* for the particular area involved. The ecology of various *Anopheles*, both vectors and nonvectors, is outlined. The important vectors of malaria in each region are designated. Collaborative data includes mosquito dissection, larval abundance and spleen indexes. The third section contains valuable observation on the dissection of female mosquitoes to determine their hibernation nonhibernation tendency and approximate time of egg laying. This book contains much essential information which is not available in any other single source. The illustrations, on the whole, are excellent and many vividly depict the great variety of habitats favored by the various vector species. It is regretted that keys to the *Anopheles* of each region are not included, but it is understandable that the preparation of such information during the war was impossible. Malaria control in the highly important Near East will be much easier to achieve because of these significant contributions.—*Major Robert Trumb, MFC, U. S. A.*

**Hospital Staff and Office Manual**, by T. M. Larkowski, M. D., F. A. C. S., Professor of Clinical Surgery, Scitch School of Medicine, Loyola University Chicago, Ill.; and A. R. Rosenow, R. Ph., M. D., Clinical Instructor, University of Illinois Medical School, Chicago, Ill. 428 pages. Illustrated. Roscoe Parsons Publishers Inc. Great Neck N. Y., publishers. 1951. Price \$5.

This handbook contains practical information on a variety of medical subjects including routine hospital technique, laboratory procedures, electrocardiography, roentgenographic technique, anesthesia, materia medica, medicolegal practice, physical medicine, medicine, surgery, otology, psychology, obstetrics, pediatrics, orthopedics, dermatology, ophthalmology, otolaryngology, psychiatry and sulfonamide and antibiotic therapy. The information is concise and accurate and the book is well illustrated. It would be useful for interns and as a ready reference for any physician or surgeon. It could be used as a review manual for state board examinations. The index is adequate and the material is well presented. A handbook attempting to cover such vast field of knowledge cannot give detailed discussions, hence the statements are dogmatic but the book does fulfill its mission as a ready reference.—*Commander T. D. Cutler, MC, U. S. N.*

**Clinical Parasitology** by *Charles Franklin Craig*, M. D., M. A. (Hon.) Sc. D., (Hon.) F. A. C. S., F. A. C. P., D. S. M., Late Colonel, United States Army formerly Director Army Medical School, and Assistant Commandant, Army Medical Center Washington D. C., Emeritus Professor of Tropical Medicine in the Tulane University of Louisiana New Orleans, La. and *Ernest Carroll Faust*, M. A., Ph. D., The William Vincent Professor of Tropical Disease and Hygiene and Head Division of Parasitology Department of Tropical Medicine and Public Health The Tulane University of Louisiana New Orleans La. Consultant to the Surgeon General U. S. Army Consultant, U. S. Public Health Service with a chapter on Control of Medically Important Arthropod by *Albert Miller*, B. S., M. S., Ph. D., Associate Professor of Parasitology (Medical Entomology) in the Department of Tropical Medicine and Public Health The Tulane University of Louisiana New Orleans La. 5th edition. 1032 page. Illustrated with 326 engravings and 6 colored plates Lea & Febiger Philadelphia, Pa. publishers 1951 Price \$12

This well-known text on medical parasitology has been expanded and brought up to date incorporating much new data resulting from the intensive research conducted in this field during World War II. The new drugs useful in the treatment of parasitic infections including chloramphenicol for the prophylaxis and treatment of scrub typhus are discussed and the recent advances in malariology have been excellently treated. Of special interest to field workers will be the excellent new chapter on the control of medically important arthropods. In addition to presenting the basic philosophy of the various types of control, the chapter contains valuable information on specific insecticides including uses, rates of application, and precautions. This book will continue to be an invaluable source of basic information on the diagnosis, treatment, and control of human parasitic diseases.—*Lt. Col. F. W. Whittemore*, J. MSC, U. S. A.

**Practical Microscopy** by *L. C. Martin*, D. Sc., A. R. C. S., D. I. C., Professor in the Technical Optics Department of the Imperial College of Science and Technology and *B. K. Johnson*, D. I. C., Lecturer in the Technical Optics Department of the Imperial College of Science and Technology 2d edition. 124 page. Illustrated. Chemical Publishing Co., Inc. Brooklyn, N. Y. publishers 1951 Price \$2.50.

The authors present the practical principles of modern microscopy from the simple hand magnifier through the various microscopes. Whether the reader is interested in only the simple dissecting microscope or the more complex optical systems of the compound microscopes, he will find not only an evaluation of the physical limitations of each instrument but also valuable notes on the means of standardization and the avoidance of pitfalls. This is accomplished concisely by the means of simple mathematical formulas and profuse illustrations. Among other chapters are presented on dark-ground and phase contrast illumination, photomicrography, the metallurgical microscope, the use of polarized light, ultraviolet microscopy, and the electron microscope. A selected bibliography is also given.—*Maj. A. Leibovitz*, MSC, U. S. A.

**Dimensional Analysis for Students of Medicine** by *Harold A. Abramson*, M. D., Assistant Clinical Professor of Physiology, Columbia University; Associate Physician and Chief Allergy Clinic, The Mt. Sinai Hospital, New York City; Consultant (Psychology), Department of the Army. 41 pages. The Josiah Macy Jr. Foundation New York, N. Y. publishers 1950 Price \$1

The author has clearly and concisely illustrated the precise meaning and significance of a number of typical formulations commonly encountered in biology, biochemistry, and medicine in terms of the fundamental physical units. The examples including such items as: the work done by the heart, chemical reaction velocities, ultrafiltration, and electron wave lengths (as

plied to the electron microscope), re-emphasize that measurements of natural phenomena are based on the fundamental units and the relationships derived therefrom must be consistent in their physical dimensions. This was the first lesson taught in elementary physics and probably most quickly forgotten and most commonly ignored by advanced students in biology and medicine. This book is highly recommended to workers in biologic sciences and medicine because its simple lesson in logic is fundamental and because only an elementary knowledge of algebra and physics is necessary for clear understanding of it.

In the foreword and preface the author has expressed the hope that widespread application of dimensional analysis may effect rapprochement between such clearly specialized psychology and psychiatry and the purely physical group; that this in turn will so affect our educational systems and culture that world peace might ensue. Although this is laudable object, the reasoning displayed here is not so logical as that exhibited in the following chapters.—Lt. Col. M. E. Freeman, MSC, U. S. A.

**Heart Disease: Its Diagnosis and Treatment**, by Emanuel Goldberger, B. S., M. D., Associate Attending Physician, Montefiore Hospital, New York; Cardiologist and Attending Physician, Lincoln Hospital, New York; Consulting Cardiologist, St. Joseph Hospital, Yonkers; Diplomate of the American Board of Internal Medicine. Lecturer in Medicine, Columbia University. 651 pages, 90 illustrations. Lea & Febiger, Philadelphia, Pa., publisher, 1951. Price \$10.

While intended primarily as a clinical monograph on diseases of the heart for the general practitioner, this complete text also provides the cardiologist, internist, and medical student with an abundance of well-organized up-to-date information on the subject. On reading this text one soon realizes that it is not just another book on the heart but that it is different in many respects from the usual monographs published on this subject. The omission of the many ancient dictums about heart disease which have been passed on from one text to another through several centuries and often found to be false; minimal reference to named signs, symptoms, syndromes, and diseases; the replacement of round table discussions on debatable subjects by clear statements of the author's opinion or experience; and the avoidance of unnecessary repetition by careful cross references throughout add to the value of the book. The author's description of the diagnostic findings and their evaluation in the diagnosis of aortic stenosis is an example of his fearlessness in discarding the accepted but incorrect teaching that a patient must have palpable systolic thrill at the base of the heart, an heard second heart sound at the aortic area, low pulse pressure and plateau peripheral pulse along with harsh systolic basal murmur before the diagnosis of aortic stenosis can be made. Many current ideas in respect to the cause, diagnosis, and treatment of heart disease which in the past have not appeared in text but were found only in current scientific journals or taught in progressive clinics, are included.

Although the author like Levin and others stresses simple bedside procedure in diagnosis, he has also included the valuable information that can be obtained from such ancillary methods of examination as cardiac catheterization, angiocardiography, the use of the ballistocardiogram, and the electrokymogram. In spite of the fact that his previous publications have been chiefly on the subject of electrocardiography he has been most conservative in emphasizing the value of the electrocardiogram in cardiac diagnosis. The arrangement of the text is excellent, each chapter being followed by bibliography that includes for the most part only references from the literature of the past 10 years. It is not overillustrated. The information given is presented briefly but clearly.—Col. T. W. Mattingly, MC, U. S. A.





# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
Agency Department of Defense*



FREDERIC W FARRAR *Captain MC U S N Editor-in-Chief*  
WAYNE G BRANDSTADT *Col ret MC U S A Associate Editor*  
ROBERT J BENTON *Colonel U S A F (MC) Associate Editor*

THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY  
THE DIRECTOR OF THE BUREAU OF THE BUDGET OCT 18, 1949

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON 1951

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

The Chairman of the Armed Forces Medical Policy Council and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy and Air Force to submit manuscripts for publication in this JOURNAL.

RICHARD L. MEHLING, M. D.  
*Chairman, Armed Forces  
Medical Policy Council,  
Department of Defense.*

GEORGE E. ARMSTRONG  
*Major General U. S. A.,  
Surgeon General U. S. Army*

LAMONT PUGH,  
*Rear Admiral, MC U. S. N.  
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*Major General U. S. A. F.,  
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Address: U. S. Armed Forces Medical Journal, Bureau of Medicine and Surgery, Department of the Navy, Washington 25, D. C.

FREDERIC W. FARRAR, *Editor in Chief*  
*Captain, Medical Corps,*  
*United States Army.*

WAYNE G. BRANDSTADT, *Associate Editor*  
*Colonel, Medical Corps*  
*United States Army*

ROBERT J. BENFORD, *Associate Editor*  
*Colonel, Medical Corps*  
*United States Air Force*



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OFFICE OF THE SECRETARY OF DEFENSE  
ARMED FORCES MEDICAL POLICY COUNCIL  
WASHINGTON 25, D. C.

MEMORANDUM: Personnel of the Medical Services of the United  
States Armed Forces

May I take this opportunity to express my sincere appreciation to each of you for your efforts these past two years as we developed the coordination of the medical and health services of the Department of Defense. You may be certain I shall follow in the months and years to come the work, the success and humanitarian efforts of each of you pulling together as "medical team" for your country, the Department of Defense, your Service and your comrades in arms.

My successor, Dr. W. Randolph Lovelace, II, I commend each of you and to you I warmly commend him. Together you will continue your stride in maintaining an ever advancing military medical service justifying the pride our nation and its citizens have placed upon you.

*Richard L. Meiling*  
Richard L. Meiling, M. D.  
Chairman

# UNITED STATES ARMED FORCES MEDICAL JOURNAL

Volume II

June 1951

Number 6

## Recent Experiences in the Treatment of War Wounds of the Chest<sup>(1)</sup>

Hu A. Blake Major MC, U. S. A.

Samuel P. Wise III, Major MC, U. S. A.

Vann S. Taylor Major MC, U. S. A.

Stephen L. Kylar Major MC, A. U. S.

Robert C. Major Lieutenant Colonel MC, A. U. S.

James H. Forsee Colonel, MC, U. S. A.

THE Korean war has resulted in 287 casualties with thoracic injuries being evacuated by air from 10 to 90 days (average 30) after being wounded, and admitted to this hospital prior to 22 January 1951. Features of their management emphasizing combined medical and surgical aspects will be discussed. The management of thoracic wounds has changed little since the major advancements in World War II and the almost universally good condition of these patients on arrival reflects excellent early care. The opportunity for detailed study of similar casualties so soon after injury in Zone of Interior hospitals was not generally afforded in World War II and the success encountered in the management of the patients here reported resulted from considering the patient as a whole. The combined efforts of the thoracic surgeon, internist, physiatrist, and the endoscopist emphasizing pulmonary function made thorough evaluation of each patient possible. There has been only 1 death in this group and that was caused by agranulocytosis 3 days after admission and was unrelated to surgical management. All but 4 (1.4 percent), exclusive of the patient who died suffering principally from thoracic trauma have returned or are expected to return to full military duty.

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(1) From the Fitzsimons Army Hospital, Denver, Colo.

## MEDICAL ASPECTS

Included in the plan for studying such patients in general hospitals has been electrocardiography, microscopic examination of the purged stool and meticulous chest fluoroscopy. Fluoroscopy has furnished significant information as to the bellows action of the lungs, diaphragmatic activity, localization of pleural fluid and metallic foreign bodies, as well as cardiac size, shape and amplitude of pulsations. In 23 patients (8.4 percent) evidence of pericarditis or myocardial injury was present. The cause was clear in 2 patients who had retained shell fragments in the wall of the right ventricle or the interventricular septum. In 5 direct trauma to the heart and pericardium is inferred. In 16 whose trauma was unilateral the cause was obscure. Electrocardiographic evidence consisting of RS-T segment and T-wave changes was present in all 16 patients; pericardial friction rub and fluoroscopic findings of pericardial effusion was also present in half of this group. One patient had a significant congenital intraventricular septal defect as well as traumatic pericarditis. This subject is discussed in detail elsewhere (2). Had comprehensive study in the forward areas been practical doubtless more instances of involvement of the heart and pericardium in thoracic injuries not directly involving these structures would have been demonstrated. No special treatment other than restriction of activity was required in any case after reaching this hospital but pericardiocentesis earlier might have hastened recovery and recognition of pericarditis would have averted the use of digitalis which was not beneficial.

Post-thoracotomy pericarditis was noted in 11.7 percent of 68 patients on whom thoracotomy was performed. This was a benign self-limiting inflammatory reaction of the pericardium, requiring no special treatment and apparently unrelated to the extent of the operation. It occurred only in patients having thoracotomies on the left side. All had normal preoperative fluoroscopic cardiac findings but abnormal postoperative changes consisting of globular cardiac silhouettes and diminished cardiac pulsations. An interesting finding in 1 patient was normal ECG 8 days after operation with typical evidence of pericarditis developing 2 days later.

Lung laceration was noted in 6 patients and in several instances pyogenic membrane was seen surrounding metallic foreign bodies removed at operation. Four patients presented what is believed to be traumatic pulmonary cavitation with retraction of the lung around the site of disruption of parenchymal continuity. A initial roentgenographic density around the cavity lacking pathologic proof may be caused by hemorrhage and atelectasis rather than inflammatory infiltration. Such concept is supported by transient spitting of blood after injury, absence of significant amounts of purulent sputum or constitutional evidences of infection, and benign course to complete healing without treatment except antibiotics given for prophylaxis (fig. 1).

(2) Wise, S. P. III. Pericarditis in thoracic trauma. (To be published.)



Figure 1—(A) Roentgenogram of the chest suggesting consolidation of the right lung in a patient having suffered a penetrating injury of the right side of the chest. (B) Same patient. Clearing of area in the right lung.

Fifteen patients developed viral hepatitis. Two appeared to be of the infectious hepatitis type and in 13 the onset was from 90 to 120 days following plasma infusion. Undoubtedly more will develop as the clinical course of these casualties is followed. The course of this disorder is benign when the patient is treated with bed rest and a high-carbohydrate, high-protein, and low fat diet. In patients with large wounds of the chest wall healing seemed to be slower in the presence of infectious hepatitis but normal in patients who developed homologous serum jaundice. Of 8 patients with thoracico-abdominal wounds associated with known liver trauma, 3 had typical lymphocytes suggestive of infectious mononucleosis. Heterophile antibodies were absent.

Twenty-six patients (9 percent) were found to have various pathogenic intestinal parasites including *Endamoeba histolytica*, hookworm *Trichuris trichiura*, *Ascaris lumbricoides*, *Strongyloides stercoralis* and *Giardia lamblia*. These findings are a reflection of the poor sanitary conditions in Korea.

Mild anxiety symptoms usually resolved with minor supportive measures but in 10 patients psychiatric symptoms were prominent. In 4 patients thresholds were so low as to interfere with adequate cooperation with the psychiatrist.

### SURGICAL MANAGEMENT

In the Zone of the Interior the problem facing the thoracic surgeon dealing with thoracic trauma in war casualties from overseas is not one of saving life but rather that of restoring pulmonary function. Equipped with the antibiotics, blood transfusions, endotracheal anesthesia and such recently developed enzymes as streptokinase and streptodornase *transmuti* thoracic surgery may well be on the threshold of even greater accomplishments. The emphasis may now be extended from the experience of World War II towards further restoration of pulmonary function and the minimizing of chest deformity. The proved safety of operation and rapid rehabilitation following thoracic surgical procedure has greatly altered the treatment of thoracic injuries. The removal of intra-pulmonary metallic foreign bodies or pulmonary decortication in the treatment of the unexpanded lung even in the presence of empyema and persistent bronchopleural fistula has proved valuable. Retained intrapulmonary metallic foreign bodies were the presenting problem in 35 (12 percent) of the 287 patients in this series. Operation was recommended and accepted by 34 patients. About 75 percent of the missiles were shell fragments jagged and irregular and usually accompanied in their passage through or into the chest by clothing and debris. Patients are generally advised to have intrapulmonary metallic foreign bodies of 1 cm. or more in diameter removed. The position of the foreign body, its size and shape, relationship to large vessels and evidence of parenchymal reaction or abscess formation

about the missile determine the need for removal (3) (4). An interesting phenomenon has been observed in uncomplicated cases of metallic foreign bodies within the lung substance in that pulmonary function studies have repeatedly shown a decrease in function on the side containing the missile which has reverted to normal following its removal.

In the treatment of traumatic hemothorax whether clotted, organized, or infected, pulmonary decortication by surgical methods has been employed in 25 patients. This procedure which was so successfully applied during World War II is being further extended in the treatment of patients with empyema and persistent bronchopleural fistula. Following parenchymal bleeding clot formation occurs at varying intervals of time with subsequent fibroblastic and capillary invasion forming the so-called "peel" of an organizing hemothorax (fig. 2). This peel does not represent thickened visceral pleura but rather a newly formed layer of fibrous tissue capable of preventing re-expansion of the collapsed lung and causing immobility of the chest wall. Its surgical removal releases the encased lung permitting an increase in its function. The use of antibiotics plus streptokinase and streptodornase preoperatively have decreased the dangers of infection associated with surgical intervention (5) (6) (7). Persistent bronchopleural fistulas have repeatedly closed following decortication with complete lung re-expansion.

As a part of the comprehensive evaluation of traumatic hemothorax and intrapulmonary metallic foreign bodies pulmonary function studies were accomplished including bronchoscopy for the elimination of the presence of any endobronchial pathology, external spirometry and bronchspirometry. External spirometry was of value in these cases only in measuring total respiratory function, emphasis being placed on the values for maximum breathing capacity, respiratory reserve and recovery following standard exercise. In these casualties however we were dealing largely with unilateral thoracic trauma and divided simultaneous lung function as determined by bronchspirometry was most important. The values for oxygen consumption and vital capacity of each lung separately were most frequently affected in these casualties. Bronchspirometry was helpful in the selection of patients for operation. It served also as a better method for evaluating results ob-

(3) Burbank, B.; Barford, T. H.; Samson, P. C., and Meslow, S.: Experience in localization of thoracic foreign body. *J. Thoracic Surg.* 15: 64-75, Feb. 1946.

(4) Fitzpatrick, L. J., Adams, A. J., and Burbank, B.: Nerve block in treatment of thoracic injuries. *M. Bull. North Africa Theat. Op.* (no. 3) 2: 51-52, Sept. 1944.

(5) Sherry, S., Tillett, W. S., and Christensen, L. R.: Presence and significance of deoxyribonucleoprotein in purulent pleural exudates of patients. *Proc. Soc. Exper. Biol. & Med.* 68: 179-184, May 1948.

(6) Read, C. T. and Berry, F. B.: Utilization of streptokinase-streptodornase in patient with hemothorax and patient with postpneumectomy sanguineous coagulum. *J. Thoracic Surg.* 20: 384-392, Sept. 1950.

(7) Sherry, S., Tillett, W. S., and Read, C. T.: Use of streptokinase-streptodornase in treatment of hemothorax. *J. Thoracic Surg.* 20: 393-417, Sept. 1950.



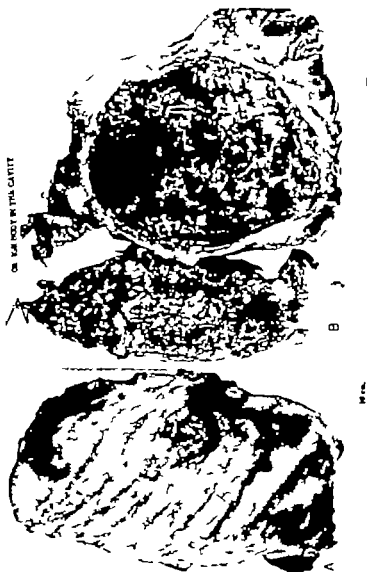


Figure 2.—(A) Intact infected hemolymph sac removed by pulmonary decortication. (B) Same sac after section. Note foreign body in the upper right-hand corner.

trained by operation (8) In World War II these data were generally not obtainable and many persons were retired from the military services who doubtless had normal or ample pulmonary function for the performance of most if not all military duties These circumstances can now be largely prevented with the resultant saving of considerable sums to the government

### REHABILITATION

The physiatrist deals with the prevention of chest deformity and restoration of function In a number of patients with borderline indications for decortication, improvement in pulmonary function following selective pressure-expansion exercises was such as to obviate operation. Selective breathing exercises were started early and vital capacity was recorded weekly This form of predominantly unilateral breathing became virtually automatic with the patient in the preoperative phase so that postoperative maintenance of a mobile chest wall and diaphragm were greatly facilitated. In the immediate postoperative phase pressure-expansion exercises were begun on the ward. Proper bed positioning and assistance in shoulder motion exercises were cared for by the physical therapist. Breathing exercises for 5 minutes of each hour and shoulder exercises at 3-hour intervals were accomplished. Frequent coughing was encouraged. Seven to 10 days after operation and following removal of the sutures the patient was followed in the Physical Medicine Clinic with individual instruction and group participation each once daily Friction massage was applied to free the tissues in the region of the surgical scar When satisfactory status was obtained the patient was sent to the physical reconditioning gymnasium for continued group therapy and by from 21 to 30 days after operation, he was fully rehabilitated and ready for convalescent furlough He was carefully instructed as to the importance of continuing pressure expansion exercises while at home

### CASE REPORTS

*Case 1*—A 22-year-old soldier was injured in the right thorax on 1 September 1950 and admitted to this hospital on 18 September On 1 September a right thoracotomy had been performed in Korea with repair of lacerations of the right lung, right diaphragm, and liver On arrival at this hospital the patient was febrile, moderately toxic, complained of marked shortness of breath, and roentgenograms revealed multiple pockets of air and fluid within the right pleural space Thoracentesis revealed purulent fluid from which hemolytic *Staphylococcus aureus* was cultured. Streptokinase, streptodornase, and penicillin were used intrapleurally with removal of increased amounts of this purulent material. The lung did not re-expand and decortication of the right lung was performed on 3 November. Densely adherent to the posterior and

(8) Forsee, J. H., and Kyles, S. L. Pulmonary function in traumatic hemothorax treated by decortication. (To be published.)

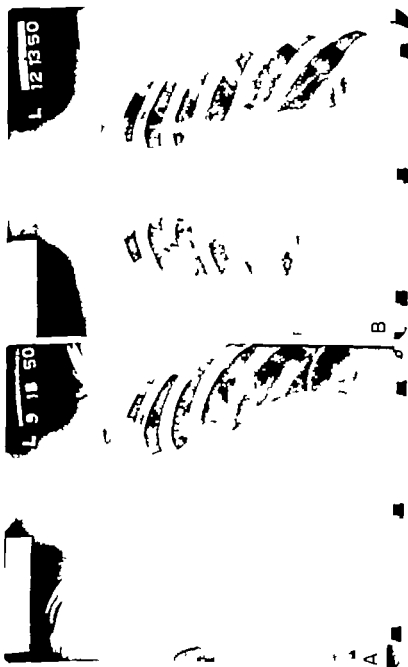


Figure 3.—(A) Roentgenogram of the chest revealing multilobulated emphysema on the right. There is no visible aortic right lung. (B) Roentgenogram of chest of same patient, 40 days following operation. The lung is completely re-expanded.

lateral portions of the chest wall and encasing the lung and the superior surface of the diaphragm was a tough fibrous peel averaging 0.4 cm. in thickness. A 150 cc. empyema pocket was situated between the two layers of the peel, the diaphragm was immobile and elevated and the costophrenic angle was obliterated. The encased lung was half its normal size. Decortication was easy and the peel was completely

TABLE 1 —*Preoperative and postoperative pulmonary function*

	19 October (percent)	1 December (percent)
Right lung		
Oxygen consumption.....	37.5	53
Vital capacity.....	36.4	53
Left lung		
Oxygen consumption.....	62.5	47
Vital capacity.....	63.6	47

removed. Immediate re-expansion of the lung and resumption of diaphragmatic excursion occurred. The postoperative course was uneventful (fig. 3). Comparison of the preoperative pulmonary function studies and those made 4 weeks following operation showed improvement of function with restoration to normal values (table 1).

*Case 2* —A 24-year-old soldier was wounded in the left thorax by multiple shell fragments on 12 September 1950. He was admitted to this hospital on 2 October complaining only of exertional dyspnea. A roentgenogram of the chest showed haziness over the left lower hemithorax and two metallic missiles were believed to be within the left lung. The left diaphragm was immobile. No fluid was obtained by thoracentesis. Pulmonary decortication with removal of an intrapulmonary metallic foreign body was performed on 3 November. At operation the

TABLE 2 —*Preoperative and postoperative pulmonary function*

	27 October (percent)	7 December <sup>x</sup> (percent)
Right lung:		
Oxygen consumption.....	80	55
Vital capacity.....	83	68
Left lung		
Oxygen consumption.....	20	45
Vital capacity.....	17	32

posterior and lateral lung surfaces were densely adherent to the chest wall and covered by a tough fibrous peel 0.8 cm. thick. Parietal and visceral components were not distinguishable because of fusion. This thick peel diminished anteriorly and superiorly. The left wing of the diaphragm was immobile, elevated, and the costophrenic angle was obliterated. Because of its adherence the peel was separated with

difficulty and could be only partially removed the descending aorta. The lung immediately resumed its normal excursions were resumed. The postoperative course was uneventful. Comparison of the preoperative pulmonary function studies made 5 weeks later showed improvement in pulmonary function (table 2). The patient was returned to military duty.

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### SUMMARY

In the management of 287 casualties from Korean thoracic injuries only one death occurred. It was due to a complication and was unrelated to operation. The application of the principles of thoracic surgery so successfully employed in World War II have been further extended with excellent results. The advancements recorded in the use of streptokinase in the treatment of traumatic hemothorax and the use of roentgenographic studies of pulmonary function as an aid in evaluating surgical results of pulmonary decortication. The unreliability of roentgenographic studies of pulmonary function has been regularly encountered. Spirometric methods appear to be valuable adjuncts in the evaluation of pulmonary function following thoracic injury. The cooperation of the thoracic surgeon, internist, endoscopist, and physiologist affords the best conditions for the management of patients suffering from thoracic injuries.

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# Early Management for War Wounds of the Genitourinary Organs<sup>(1)</sup>

Burdick G. Clarke *Lieutenant Commander MC, U. S. N. R.* (2)

Wyland F. Leadbetter *M. D.* (3)

THE outbreak of fighting in Korea during the summer of 1950 prompted us to review all available published reports on the treatment for war wounds of the genitourinary tract during World War II and such other literature on developments since the war that would have a bearing on the treatment for such wounds. The cardinal importance of antibiotics, of body fluid replacement, and of modern technique in anesthesia in the successful management for war wounds was proved during World War II. Progress in these fields has continued so rapidly during the intervening 5 years that much of the wartime experience has been supplanted by more recent observations. We have chosen therefore chiefly to consider the experience gained in surgical technique during and since World War II. This article results from a study and summary of this material and offers recommendations for treatment based on it.

The treatment for battle casualties may be regarded as having three phases: (1) diagnosis and emergency treatment; (2) early definitive operation; and (3) later definitive operation and the management of complications. These three phases of treatment are performed at echelons in the rearward movement of casualties which vary with the tactical situation and depend on theater evacuation policy. Because the latter are the concerns of military command it is not our purpose to

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(3) Clinical Professor of Urology, Tufts College Medical School, Chief of Urology, New England Medical Center, and Associate Visiting Urologist, Massachusetts General Hospital, Boston, Mass. Formerly Lieutenant Colonel, A. U. S.

difficulty and could be only partially removed about the lower end of the descending aorta. The lung immediately re-expanded and diaphragmatic excursions were resumed. The postoperative course was uneventful. Comparison of the preoperative pulmonary function studies and those made 5 weeks later showed improvement with return to virtually normal function (table 2). The patient was returned to full military duty.

### SUMMARY

In the management of 287 casualties from Korea suffering from thoracic injuries only one death occurred, it was caused by agranulocytosis and was unrelated to operation. The application of the principles so successfully employed in World War II have been further extended with excellent results. The advancements recorded appear to be the encouraging results encountered in the use of streptokinase and streptodornase in the treatment of traumatic hemothorax and the studies of pulmonary function as an aid in evaluating surgical results especially of pulmonary decortication. The unreliability of roentgenographic evaluation of pulmonary function has been regularly encountered but bronchspirometric methods appear to be valuable adjuncts in assessing pulmonary function following thoracic injury. The working together of the thoracic surgeon, internist, endoscopist, and physiatrist as a team affords the best conditions for the management of patients suffering from thoracic injuries.

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consider them in detail, but to confine our attention to aspects of the care of the wounded which are primarily matters of surgical judgment.

In genitourinary tract wounds the objective of front line installations is the saving of life. In forward surgical units urologic treatment is chiefly the emergency management of kidney and bladder wounds and the conservation of tissue in wounds of the external genitalia. In addition, however, it was shown during World War II that primary definitive treatment of ureteral and urethral wounds when possible diminishes subsequent morbidity and disability and strikingly improves the final result. Because the management of urologic complications and a coordinated operative procedures for wounds of the urogenital organs are usually undertaken only in hospitals in the rear area where the necessary special equipment is available together with experienced urologists we have omitted consideration of these problems from the present article. For convenience in discussion, wounds of the kidneys, ureters, bladder, prostate and urethra, and the external genitalia are considered separately.

### KIDNEY WOUNDS

*Occurrence*—Renal injury occurs in 5 to 7 percent of abdominal wounds and in 10 percent of thoracoabdominal wounds. Twenty percent of 129 kidney wounds reported in the literature were associated with thoracic wounds. Fifty-nine percent of 296 patients with kidney wounds occurred in association with wounds of other abdominal organs. Wounds thus complicated are more serious than those in which the kidney alone is injured.

*Recognition* of kidney wounds requires examination for wounds of entry and exit with reference to the cross-sectional anatomy of the region. The presence of ecchymosis of subcutaneous urinary extravasation, and of urinary drainage through surface wounds must be noted. The urine must be examined for blood when renal injury is suspected in thoracic and abdominal wounds and the patient catheterized if necessary. Catheterization should not be done, however, until facilities for operation are available. Hematuria, gross or microscopic was reported in from 88 to 100 percent of collected cases. If the major renal injury is to the vascular pedicle or if the ureter is transected or obstructed by clots hematuria may not be found.

Roentgenographic examination of the kidneys when possible in the forward area should be made on all patients with suspected renal injury unless severe shock is present. If contrast media are not available the flat film alone may be studied for such clues to renal injury as haziness of the renal outline, hematoma mass in the kidney area, obliteration of the psoas outline or the presence of foreign body or free gas. When time or help are short or it is not desired to move the patient, the usual methods of excretory urography may be reduced to taking a single roentgenogram after injection of the dye. Most of the

patients are dehydrated when first seen and good dye concentration may be expected. Dye injection may be performed during early triage by a member of the shock team. A roentgenogram is made 15-minutes later if no dye excretion is apparent, another roentgenogram may be made after waiting 15 minutes more. This roentgenogram may be used to locate foreign bodies and studied for evidence of injury to the skeleton and abdominal viscera. The excretory urogram often permits accurate evaluation of the extent of renal or ureteral damage. Its use is required to determine the presence of a normal kidney on the uninjured side. The incidence of congenital solitary kidney is about 1 in 1 000 persons and cases of traumatic rupture of a single kidney with fatal outcome because of failure to recognize the anomaly have been reported. Urine and dye excretion may be suppressed in the injured kidney during the first 6 to 10 hours after injury. Urinary suppression occasionally may occur in both kidneys.

Cystoscopy and retrograde pyelography are valuable supplements in the diagnosis of renal injury but in the field are of limited usefulness and should only be undertaken by experienced operators. Although these procedures are hazardous in the presence of shock or of extensive pelvic fractures they yield definite accurate information on the condition of both kidneys and the risk of infection resulting from cystoscopy is slight.

*Early definitive operation.*—Except in occasional patients with massive hemorrhage surgical intervention should be delayed until shock has been controlled. Laparotomy is indicated when combined wounds of the kidney and the abdominal viscera are suspected. In such patients examination of the renal and retroperitoneal regions is required. When delay in making an additional incision is not warranted in order to treat the kidney injury the kidney may be approached transperitoneally. This operation is more difficult on the right side than on the left. It may occasionally be desirable to close the peritoneum after abdominal exploration extend the incision laterally and proceed with retroperitoneal exploration. When the extraperitoneal flank incision is used, this may be made by debriding and extending one of the existing wounds or a large new well placed incision may be made to assure the best possible exposure of the kidney. The flank incision may be of the classic oblique subcostal type or transverse. Both types of incision may be extended anteriorly to permit exploration of the upper abdominal cavity. The twelfth rib may be resected to give wider exposure.

Combined thoracico-abdominal incisions were used successfully for early treatment of kidney wounds with associated intrapleural and intraperitoneal injuries during World War II. The patient was placed in the kidney position under endotracheal anesthesia. Resection of the tenth rib permitted exposure and repair of the lung kidney and intraperitoneal viscera. The renal bed was drained when necessary and the diaphragm closed with separate layers of sutures to its pleural and

peritoneal surfaces. The chest was closed in layers aspirated immediately after operation and later when necessary. Originally this approach was used on the left side. Subsequently the technique of thoracico-abdominal nephrectomy for use on either side of the body has been developed and described.

Once the kidney has been exposed what is done will depend on the type and extent of damage. A conservative primary operation was possible in 151 of 205 cases collected from reports based on wartime experience. In 126 of these exploration and débridement with drainage or packing were the only maneuvers required. In 25 patients renal repair was possible and in 54, primary nephrectomy was required. In 11 cases débridement and exploration with removal of foreign bodies is necessary. Perforating and penetrating wounds of the kidney without much disorganization may be treated simply by débridement, hemostasis and drainage. Although packing may be used when necessary for hemostasis it should be possible in most instances to control bleeding by properly placed sutures.

Lacerated wounds of the kidney should be treated by suture and repair. Even extensive lacerations of the kidney provided the blood supply and kidney pelvis are intact may not require nephrectomy. Figure-of-eight or mattress suture are particularly useful in renal repair and hemostasis. Muscle (high in content of thromboplastic substance), or fat, or the newer chemically refined hemostatic substances may be incorporated in these sutures for hemostatic purposes. With the increasing experience now at hand in vascular anastomoses suture of the renal vessels is possible and should certainly be tried on suitable wounds of the vascular pedicle. The literature as yet contains no report of the successful use of such methods in war casualties.

Nephrectomy as primary treatment, should be reserved for patients showing continuing massive hematuria uncontrollable hemorrhage or urinary extravasation, or for patients in whom operation has revealed massive destruction or infarction of renal tissue. A rising pulse rate is a good indicator of progressive hemorrhage in these patients. Nephrectomy is required for secondary hemorrhage whether it occurs after open wounds or nonpenetrating injuries of the kidney. This grave but comparatively infrequent complication may be expected in the second and third weeks after injury. Bed rest for at least 10 days after injury is required as a prophylactic measure. Nephrectomy is indicated in certain patients with overwhelming infection.

*Nonpenetrating kidney injuries*—A large amount of excellent literature concerned with nonpenetrating injuries of the kidney seen in civilian practice has developed in recent years. Because of the increasingly wide use of motorized and armored transport in modern warfare it may be expected that this type of injury will occasionally be encountered in the field. In most patients, injury is caused either by impact of the kidney on the twelfth rib or of the rib on the kidney depending on the

direction of the blow. All degrees of damage to the kidney pelvis and vascular pedicle may occur from contusion and laceration to extensive rupture and infarction. The typical clinical findings consists of flank pain and hematuria, shock, reflex gastrointestinal disturbances and often a mass in the flank caused by extravasated urine or blood. When intravenous urograms show unsatisfactory definition of the extent of renal damage or reflex anuria retrograde examination should be made. Conservative treatment has been possible in most of the cases reported. Operation is indicated in the presence of increasing swelling in the flank continuing massive hematuria or urographic evidence of severe renal damage. At operation as in open wounds hemostasis or repair may often be accomplished without nephrectomy. The indications for nephrectomy parallel those in open kidney wounds: uncontrollable hemorrhage or urinary extravasation, massive destruction or infarction of the kidney or secondary hemorrhage.

*Postoperative observation and complications.*—In all patients with renal injury sustained observation by examination of the urine and intravenous urograms is required after apparent clinical recovery. Complications which have been reported include strictures, intractable urinary tract infection, calculus formation, persistent fistulas, pyonephrosis, hydronephrosis, cystic calcification of hematoma, and ball valve obstruction of the renal pelvis by a bullet. Hypertension as a late complication of kidney injury has not been observed. Air blast injuries of the kidney with renal pain and hematuria but normal excretory urograms respond to conservative treatment. Kidney and bladder injury caused by underwater concussion has not been observed.

### WOUNDS OF THE URETER

*Occurrence.*—The ureters are deep of small diameter and related along their courses to abdominal viscera and the spinal column. Wounds sufficiently destructive to involve them are almost certain to involve other vital structures. Death is likely before the patient reaches the forward hospital.

*Recognition.*—Hematuria is diagnostic if injury to the kidney and bladder can be excluded and the ureter has not been completely divided or obstructed by clots. Likewise leakage of urine from the wound is a most important sign. Intravenous urograms should be made in all patients with suspected ureteral injury as soon as possible. They will often yield definite information on the extent and location of the ureteral wound, the relative position of foreign bodies and the degree of associated skeletal damage. Retrograde examination, whether early or late, may be used when necessary and is even more accurate. The Braasch bulb-tipped ureteral catheter, when available, is particularly useful in the production of ureterograms. Before exploratory operation in a patient with suspected ureteral injury a ureteral catheter should be passed if the patient's condition warrants. Although at laparotomy for abdominal wounds it is sometimes possible to recognize ureteral

injury the peril of untreated intraperitoneal urinary leakage from damaged ureter is great and hence exact work up of patients with suspected ureteral wounds should be completed as early as possible. Extraperitoneal urinary drainage from a damaged ureter appears to be less dangerous to life even without drainage than from other parts of the urinary tract. Primary recognition of ureteral wounds was uncommon in the last war occurring only when a urinary fistula developed in the flank from 7 to 10 days after injury. If wound tracts are blocked by tissue retroperitoneal extravasation produces a mass in the flank which usually becomes infected.

*Early repair of ureteral wounds*—In war wounds of the ureter and urethra alike best results are obtained by early re-establishment of continuity of the channel over a catheter with diversion of the urinary flow above the injury. Local urinary extravasation and infection with resultant scarring are thereby minimized, and stricture formation, ureteral deformities and interference with drainage are less frequent and are more readily managed with sounds when they occur. The technique chosen for re-establishing ureteral continuity must be adapted to the location and extent of damage in each case. Occasionally ureteral wounds which have healed without operative treatment have been reported. In a few patients good results have been obtained merely by leaving a catheter in the ureter for from 3 to 10 days. In most patients however early operative repair of the ureter should be undertaken. In all such patients diversion of the urinary stream above the injury by pyelostomy or nephrostomy is necessary. Any standard catheter of suitable type may be used for this purpose. The smaller ureteral splinting catheter if used should also be brought out through the renal pelvis or parenchyma. Extraperitoneal soft tissue drainage also is usually required. If sufficient ureteral wall remains a longitudinal laceration may be treated by simple suture with splinting catheter in place.

During and since the war the technique of intubated ureterotomy has been developed. This method should prove to be well adapted for use in war wounds with loss of a longitudinal segment of the ureteral wall. The principle consists in placing a long 12 or 14-gage French soft rubber splinting catheter within the damaged ureter. Pyelostomy is performed and the catheter left in place for from 4 to 6 weeks. Experimental studies have shown that regeneration of the mucosa and muscularis is complete within this period. Catheters of synthetic plastic materials have recently been found to cause a minimum of tissue reaction and encrustation and should be used if they are obtainable.

Transverse injuries of the ureter require debridement of the injured end, careful suturing and splinting catheter. Diversion of the urine above the anastomosis by pyelostomy or nephrostomy is required, to minimize extravasation. The classic technique of end-to-end anastomosis of the ureter consists in the use of fine interrupted suture which do not penetrate the mucosa. Good results were secured in 3 of 5 patients.

with war wounds thus treated. The failures were caused by extravasation in one patient and by stricture in the other.

Experimental studies have been reported on a technic of ureteral anastomosis which yielded excellent results. This method essentially an application of the technic of aortic suture consists of a continuous extramucosal, arterial silk mattress suture everting the outer edges of the ureter. This development merits trial in suitable patients with war injuries.

Injuries of the lower ureter may require ureterovesical anastomosis. This was performed after a gunshot wound as early as 1903. Four patients were reported during the war; good results were obtained in three. It may occasionally be impossible at the first operation to find the end of the ureter or damage may be too great to permit anastomosis. Temporary nephrostomy, ureterostomy or flank drainage may be performed pending a later reconstructive operation. If necessary a primary nephrectomy may be performed.

*Postoperative observation and complications*—After any type of ureteral injury or repair prolonged observation for stricture is required, using intravenous and when necessary retrograde urograms. Late complications which have been reported from war wounds include intractable urinary fistulas, hydronephrosis, pyelonephritis, lithiasis or pyonephrosis.

### WOUNDS OF THE URINARY BLADDER

*Occurrence*—Bladder injury is common in wounds of the lower abdomen, hips, buttocks, thighs and perineum. Buttock wounds communicating with the bladder were found in from 56 to 75 percent of reported cases. Associated wounds of the lower bowel are the rule rather than the exception. In 70 percent of the 315 bladder wounds on which data could be collected wounds of the small or large intestine or of the rectum, were present. Purely extraperitoneal wounds are uncommon. Eighty-three percent of 262 patients had intraperitoneal or combined intraperitoneal and extraperitoneal perforations. The prognosis is poorer when intraperitoneal perforations are present. Injury to the bony pelvis is common.

*Recognition*.—Early recognition and treatment of wounds of the bladder and posterior urethra is of prime importance. Unrecognized or untreated urinary extravasations with infection in the peritoneal space or in the retroperitoneal or perivesical tissues is associated with a high mortality rate. The symptoms of bladder perforation are hematuria, prevesical pain, vesical tenesmus or inability to void. Hematuria was reported in 150 of a group of 155 of these patients. The other symptoms are of relatively little clinical importance, often masked by shock and the multiplicity of accompanying injuries.

In all patients examination for wounds of entry and exit with reference to the cross sectional anatomy of the region is required, in some



suprapubic urinary extravasations occur. The abdomen should be palpated for bladder distension. Urinary drainage from a wound in the region of the pelvis is diagnostic of perforation of the bladder or lower ureter. Urinary drainage from the rectum or passage of feces in the urine indicate rectovesical perforation.

Because of the high frequency of intraperitoneal vesical perforations and of associated bowel injury laparotomy is required in most such patients. The high mortality rate from unrecognized extravasation with peritonitis or retroperitoneal and perivesical cellulitis makes exploratory cystotomy mandatory at the first operation in nearly all of the patients. In a group of 155 patients managed in the forward area on this basis the correct diagnosis was made preoperatively or at operation in 149.

Although early exploration is usually required, other diagnostic methods are of tried value in the recognition of bladder wounds. First among these is catheterization with a 16 ft rubber catheter and rectal examination with the catheter in place. Catheterization should be withheld, however until facilities are available for operation. Coexisting urethral wounds occur in association with a high proportion of bladder wounds, and their detection by this means is important. If either the membranous or prostatic urethra is torn, the tip of the catheter hangs and may be located by rectal palpation. The examining finger detects intravesical extravasations of blood and urine. At the same time extravasation is noted in perineum and scrotum. Successful placement of the catheter within the bladder demonstrates the presence or absence of urinary retention, but failure to obtain urine suggests intraperitoneal perforation.

Roentgenogram of the pelvis when possible in the field should be used on most patients to localize foreign bodies and to disclose damage to the bony pelvis. If ureteral injury is suspected, these films may be obtained with catheter in place. Retrograde cystourethrography with air or a radiopaque medium is a valuable aid in the diagnosis of bladder perforations caused by nonpenetrating pelvic injuries, notably those associated with pelvic fractures. In penetrating wounds, because of the high incidence of intraperitoneal perforation and of associated bowel injury laparotomy is usually required in any case and cystourethrography may be dispensed with. A measured quantity of physiologic saline solution may be instilled through the catheter and withdrawn to determine if there has been loss of fluid from the bladder through perforation. This has been recommended in patients with bladder perforation caused by nonpenetrating injuries of the pelvis. The method is probably of limited value in war wounds.

Cystoscopy for diagnosis of bladder perforation in war wounds is not recommended, it contributes to shock in the unanesthetized wounded, it is technically unsatisfactory if intraperitoneal perforation exists and it is less dependable as a means of diagnosis than is exploratory cystotomy.

*Early definitive operation.*—The principles of early surgical treatment of bladder wounds are (1) cystotomy for hemostasis (2) repair of perforations (3) débridement and drainage of extravasations and (4) postoperative diversion of urine by suprapubic cystostomy. Intrapertoneal exploration and cystotomy are usually performed through the same lower abdominal incision. If the celiotomy incision for wounds of other viscera is inconveniently located a separate suprapubic incision may be made for cystotomy. In some patients exploration can be performed after debriding and extending existing abdominal wounds; in others new exploratory incisions are required.

The bladder is opened and explored. The ureters may be catheterized at this time to assure recognition of lower ureteral injuries. The edges of intraperitoneal perforations are debrided. Intrapertoneal perforations are always sutured. Perforations in the base of the bladder located extraperitoneally are repaired when this is technically feasible. Failure to close the bladder, in the presence of adequate drainage, appears to be of secondary importance though convalescence may be prolonged.

Repair of perforations is made with interrupted sutures of catgut extramucosally placed. If hemostasis is required sutures may include the full thickness of the bladder wall. The perivesical and prevesical spaces are debrided and drained through separate incisions if necessary. The consensus is that the prevesical space should usually be drained though opinion differs on the desirability of this as a routine procedure. If there is coexisting injury of the urethra an inlying catheter is inserted. Peritoneal drainage though widely favored during World War I is unnecessary with contemporary chemotherapeutic methods. A large (34-gage French) suprapubic catheter of the Malecot or de Pezzer type is placed high in the dome of the bladder. High position of the tube is necessary to protect the trigone and symphysis. The catheter is brought out along an oblique tract to facilitate subsequent healing.

Most observers during World War II agreed that suprapubic drainage is the safest and most dependable type after repair of bladder perforation. It is particularly necessary when casualties may be evacuated to the rear without assurance of sustained and careful attention to their catheters. Successful use of only an inlying urethral catheter for postoperative drainage has occasionally been reported, though cutaneous urinary fistulas through wounds of entry or exit usually resulted when this method was used. When rectovesical perforation exists colostomy as well as cystotomy is required.

Blast injury of the bladder was reported in 4 patients who had frequency, urgency and hematuria after being in the vicinity of explosions. All had occult hematuria and showed punctate hemorrhages on cystoscopy.

*Postoperative observation and complications.*—Cystoscopy and cystography are required in the follow-up observation of patients with

bladder wounds. Complications which have been observed include persistent cutaneous fistulas other than suprapubic perivesical abscesses, pyelonephritis, deformities caused by scarring, spontaneous stone formation and stone formation about metallic fragments in the bladder wall or within the bladder.

### WOUNDS OF THE PROSTATE AND POSTERIOR URETHRA

**Occurrence.**—Wounds of the prostatic, membranous and bulbous urethra are usually associated with wounds of the abdomen, external genitalia, buttocks, thighs, perineum, bladder, rectum, or bony pelvis. Perforations of the bladder are not uncommonly associated with urethral injuries. Fracture of the pelvis caused by nonpenetrating injury was accompanied by rupture of the bladder or posterior urethra in 15 percent of 1,066 cases collected from reports of civilian experience.

**Recognition.**—The principal signs of injury or rupture of the posterior urethra are bleeding at the meatus or inability to void if the rupture is complete. Urinary surface drainage if it occurs is diagnostic. Diagnosis when facilities for operation are available is best accomplished by passage of a rubber catheter with rectal palpation of the urethra over it. Urine cannot be withdrawn though sometimes blood is obtained. Roentgenograms of the pelvis with catheter in place yield necessary information on the condition of the bony pelvis and aid in localizing damage to the urethra. The rectal examining finger detects displacement of the catheter, displacement of the prostate, infravesical extravasations of blood and urine, and adjacent displaced fragments of the bony pelvis. Extravasation of urine from the ruptured urethra into the tissues is more common in small wounds than in large open wounds which afford free drainage. Extravasations in war wounds may not conform exactly to tissue planes because of disruption of the latter by missiles. In general, perforation of the membranous or prostatic urethra results in extravasation into the perivesical and retroperitoneal spaces, the ischiorectal fossa, etc. Rupture below the urogenital diaphragm is likely to result in subcutaneous extravasation into the scrotum, penis, lower abdomen or perineum. Rapid infection of urinary extravasations in these areas is the rule and prompt operation is required.

**Early definitive operation.**—In all patients diversion of urine by cystostomy and drainage of extravasation are required. If possible restoration of urethral continuity should be attempted at the time of first operation. Subsequent urinary extravasation and local sepsis result in scarring and deformity which greatly increase the difficulty of late repair. Strictures developing after primary repair are usually benign, of large caliber, and easily controlled with sounds. Those resulting from treatment by diversion of the urine alone without the use of a splinting catheter are consistently more severe and require secondary operative treatment in a high proportion of patients. The principles of primary treatment are (1) diversion of urine by suprapubic cystostomy with perivesical and perivesical drainage to save life; (2) provision of

an inlying catheter to serve as a splint; and (3) some type of surgical approximation of the damaged tissues. A number of refinements of these maneuvers are possible.

Alternative means of restoring urethral continuity at the command of the surgeon are several. In some patients notably those with partial rupture a splinting catheter left in place for several weeks is all that is required, in addition to suprapubic drainage to obtain a good result. In patients of this type in whom the torn urethral ends are separated by upward displacement of the prostate traction may be placed on a Foley type catheter. The same objective may be attained by suprapubic suturing of the prostate to the triangular ligament or by placing through-and-through traction sutures through the prostate suprapubically leading them out beneath the symphysis through the perineal skin behind the scrotum.

If an open perineal wound exists or if the wound involves the bulbous urethra primary perineal repair of the urethra should be attempted, after local débridement, over an inlying catheter. The surgical approach to the bulbous urethra is direct. Approaches to the prostatic and membranous urethra do not differ from those used in perineal prostatectomy. Delayed primary closure or secondary closure of open perineal wounds should be undertaken as soon as possible to minimize scarring and subsequent urethral deformity. If after perineal débridement, the edges of the urethra are accessible they should be sutured. If this is impossible the more centrally located periurethral soft tissues may be approximated over the catheter with the expectation of recanalization.

When the urethra is completely severed and its ends can be mobilized and debrided, primary end-to-end anastomosis can be accomplished successfully over a catheter using fine interrupted, chronic catgut sutures with as little tension as possible. The urethra is covered with as many layers of subcutaneous tissue as possible. Operators familiar with the perineal approach to the prostate may elect to undertake primary repair of the ruptured urethra in the absence of open perineal wounds. These wounds should be drained to prevent localized infection and a 24- or 26-gage French catheter secured in the urethra as a splint. Secondary hemorrhage occasionally complicates urethral repair.

To locate the displaced ends and catheterize the torn urethra a number of expedients have been used successfully. The cùde rubber catheter introduced gently may be valuable. Sounds one of which may be ground hollow at the tip to engage the other may be introduced through each end of the urethra after the cystotomy has been performed and made to meet. The open end or the cut tip of the catheter may be slipped tightly over the tip of one sound and then drawn through the urethra. A Foley catheter on a curved director or a sound may be introduced through the penile urethra with a finger through the cystotomy in the prostatic urethra to serve as a guide.

*Postoperative observation and complications*—Using sounds or urethrograms, all patients should be observed for stricture after injury. Late strictures may develop if primary urethral repair has not been undertaken or has been unsuccessful. Secondary repair of strictures and excision of fistulas after establishment of suprapubic drainage may be planned to suit the requirements of each patient.

#### WOUNDS OF THE EXTERNAL GENITALIA AND ANTERIOR URETHRA

During initial treatment of wounds of the external genitalia, associated wounds of the urethra, perineum, abdomen, thighs and hips must not be overlooked. Early treatment consists of hemostasis and conservative débridement. Testicular lacerations seen early or late should be debrided and the tunica albuginea closed to prevent hemilation and loss of spermatogenic tissue. The testis is always preserved unless its blood supply is destroyed. Anterior urethral injury necessitates the use of an indwelling urethral catheter and repair if tears are present. Reconstruction of a damaged corpus cavernosum of the penis or urethra should be attempted as early as possible. Plastic surgical procedures for replacement of skin loss from the penis and scrotum may be performed primarily in favorable cases or delayed until a clean wound has been obtained by conservative débridement and local treatment.

# Osteochondritis Dissecans of an Interphalangeal Joint

Allan B Ramsay Colonel MC U S A (1)

Joseph W Batch Colonel, MC, U S A (1)

THE radiologic pathologic and therapeutic aspects of osteochondritis dissecans have been adequately discussed in the literature. It is our purpose to report a case of a common pathologic process occurring in an extremely uncommon site.

## CASE REPORT

A 14-year-old white boy reported to the out-patient service of this hospital on 22 December 1950 complaining of pain and swelling in the



Figure 1 —Lateral aspect of the left thumb showing soft tissue swelling.

interphalangeal joint of the left thumb. About 2 months previously he first noticed pain, limitation of motion, and swelling of this joint. There was no history of trauma or infection. The swelling gradually increased and the subjective symptoms, including tenderness on pressure, became exaggerated.

(1) Army and Navy General Hospital, Hot Springs, Ark.

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Physical examination was negative except for soft tissue enlargement on the lateral aspect of the interphalangeal joint of the left thumb (fig. 1). Flexion of the joint was definitely decreased and pain was elicited by this movement.

Radiographic examination revealed a partially detached shadow of bone density on the lateral aspect of the distal articular surface of the proximal phalanx measuring about 2 by 3 by 3 mm. Around this shadow there was a narrow semilunar band of radiotranslucency. This was observed in the lateral anteroposterior and oblique projections (fig. 2).

On 27 December 1950 an incision was made along the lateral border of the involved joint, carried down through the thickened joint capsule and the partially detached bone fragment was dissected free (fig. 3). The lateral margin of the articular surface of the bone was removed by means of an osteotome which easily scooped out the involved indented

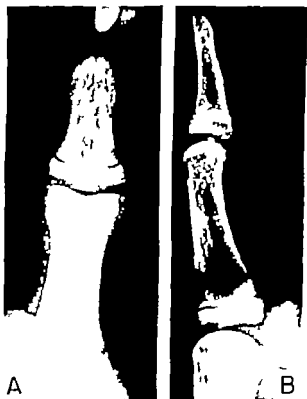


Figure 2.—(A) Anteroposterior roentgenogram showing partially detached osteochondral body and overlying soft tissue swelling. (B) Lateral roentgenogram showing a shadow of increased density surrounded by areas of decreased density.



*Figure 3 —Osteochondral body reflected from its bed on the head of the proximal phalanx of the left thumb.*

base or bed of the lesion. A small sesamoid was also removed even though it appeared quite normal.

The pathologist reported that the section consisted of a small portion of cartilage which was partially surrounded by fibroblastic tissue. Within this there was a small deposit of calcium salt without definite bony structure. There was piling of the cartilage cells suggesting replacement by calcium. Impression: osteochondritis dissecans.

### DISCUSSION

We were interested in this case because neither of us had seen a case of osteochondritis dissecans occurring in an interphalangeal joint and because the clinical entity was causing the patient great distress. Reference to texts at hand failed to disclose any report of the condition occurring in an interphalangeal joint. Brailsford (2) stated: "Though this lesion is most commonly encountered in the articular surface of the medial femoral condyle (often slightly posterior to the midline) the author has observed it in the lateral condyle, the patella, the femoral capital epiphysis, the capitellum, the head of the

(2) Brailsford, J. F. *The Radiology of Bones and Joints*, 4th edition, Williams & Wilkins Co., Baltimore, Md., 1942, p. 197.

radius, the humerus, the navicular, the astragalus, the first metatarsal and the lower end of the tibia. Hutchison (3) reported a case in which the lesion occurred in the base of the proximal phalanx of the great toe, but failed to find a similar case recorded in the literature. Lavner (4) reviewed the literature and analyzed 42 cases of his own, including a case in which the lesion involved the base of the proximal phalanx of the great toe. Neither of these lesions, both of which involved the metatarsophalangeal joint of the great toe, reported by Hutchison or Lavner was proved to be osteochondritis dissecans by operation, but the radiographic appearance was so typical of this disease that contradiction is precluded.

Our case, in which complete clinical relief was obtained with the removal of the necrotic lesion and debridement of the site of occurrence, is offered as a heretofore unreported site for osteochondritis dissecans.

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(3) Hutchison, R. G.: Osteochondritis dissecans; records of some unusual cases. *Brit. J. Radiol.* 16: 147-149 May 1943.

(4) Lavner, G.: Osteochondritis dissecans, analysis of 42 cases and review of literature. *Am. J. Roentgenol.* 57: 56-70 Jan. 1947.

# Asymptomatic Active Pulmonary Tuberculosis

G. Arnold Crook, M. D. (1)

Dexter Lufkin, M. D. (2)

Thomas L. Ryan (3)

THE data on 1188 patients with active pulmonary tuberculosis admitted for treatment to a sanatorium are herewith analyzed in terms of discovery of the disease—by traditional symptoms or by routine roentgenograms of the chest—and reveal significant findings concerning asymptomatic active pulmonary tuberculosis. The modern approach to the control of pulmonary tuberculosis is based on the discovery and isolation of epidemiologically significant cases and the work of public health agencies has been handicapped for decades by the frequent occurrence of asymptomatic pulmonary tuberculosis. This dangerously subtle aspect of the disease has emphasized the value of the photofluorographic approach to case finding. This study compares patients initially diagnosed on the basis of routine roentgenograms of the chest with those initially diagnosed by symptoms with respect to (1) degree of tuberculosis as visible in roentgenograms (2) admission to hospital purely as a consequence of routine roentgenographic examination of the chest and (3) frequency of occurrence of specific symptoms. Patients discovered by routine roentgenograms include a higher proportion of the minimal type of the disease than do those admitted on the basis of symptoms.

## SOURCE OF DATA

All patients here reported were veterans of the Navy and the Marine Corps. Their ages ranged from 17 to 40 years; the mean age was from 20 to 25. The duration of their military service ranged from 6 months

(1) At the close of this study Lieutenant, MC, U. S. N. R., U. S. Naval Hospital, Sampson, N. Y., now Assistant Director Student Health Service, Syracuse University; physician for the Bureau of Tuberculosis, City of Syracuse; and instructor of medicine, New York State College of Medicine, Syracuse, N. Y.

(2) At the time of this study Lieutenant Commander, MC, U. S. N. R., U. S. Naval Hospital, Sampson, N. Y., now Assistant Chief of Tuberculosis, Veterans Hospital, Hot Springs, S. D.

(3) Chief Pharmacist, Mater U. S. N., Retired.

to 5 years. Nearly all had been inducted into the services in World War II and had been accepted as free from disease on the basis of physical examination and a roentgenogram of the chest. A few patients had developed tuberculosis in Japanese prison camps after prolonged inadequate diet and exposure to an extremely adverse environment, but most of the patients had received an excellent diet and sufficient rest although military exigencies frequently necessitated crowding of personnel. All patients were hospitalized for treatment at the U. S. Naval Hospital Sampson, N. Y. during 1945 and 1946. They are analyzed in two main groups: Group I was composed of 859 patients admitted in consequence of routine roentgenograms of the chest. This examination usually was preliminary to discharge from military service. Group II was made up of 329 patients admitted because of symptoms. Most of them had been on active duty.

All patients were reviewed and classified according to standards established by the National Tuberculosis Association. All case histories and roentgenograms were studied by several staff members to facilitate uniformity in diagnosis. Only patients admitted with active disease are included.

Table 1 indicates a shift in the type of patient admitted to sanatoria in the United States. Formerly sanatorium reports underscored the fact that 80 percent or more of admissions fell in the moderately advanced or far advanced categories. Studies of routine roentgenographic surveys reveal that this case-finding technique brings in an increased proportion of patients with minimal disease. Use of this technique should ultimately be reflected in tuberculosis morbidity and mortality rates because potential sources of infection would be removed from the general population in the early stages of the disease. It is hoped that discovery and treatment of such patients with minimal disease will reduce the death rate among tuberculous patients.

TABLE 1 — *Basis of hospital admission and classification*

*Basis of hospital admission*

Quantitative classification	Routine roentgenogram (Group I)		Symptoms (Group II)	
	Number	Percent	Number	Percent
Minimal	312	36.3	55	16.7
Moderately advanced	432	50.3	175	53.2
Far advanced	115	13.4	99	30.1
Total	859	100	329	100

\*1940 National Tuberculosis Association Standards

## ASYMPTOMATIC ACTIVE PULMONARY TUBERCULOSIS

Until the past decade necessary dependence on development of symptoms to establish a diagnosis of tuberculosis left much to be desired. The prevalence of asymptomatic active tuberculosis is indicated by further subdivision of Group I as shown in table 2. Totally asymptomatic patients will be referred to as Group IA and those in whom symptoms which had not been interpreted properly were present will be referred to as Group IB. In view of the fact that 80 percent of the asymptomatic patients had either moderately or far advanced disease a brief review of the mechanisms of symptom production is pertinent. Like most tissues and organs the lungs exhibit tremendous functional reserve. This fact is emphasized not only by observers of pulmonary disease but also by thoracic surgeons who obliterate or remove a large portion of functional pulmonary tissue without appreciably disabling the patient. In most instances the lesions and the pathologic physiology of pulmonary tuberculosis develop slowly. This could be expected from the inherent characteristics of the *Mycobacterium tuberculosis* and the natural resistance of most human beings to it.

TABLE 2—Admissions by routine roentgenographic examination (Group I), classified quantitatively and by presence of symptoms

Group 1	Quantitative classification							
	Minimal		Moderately advanced		Far advanced		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Asymptomatic (Group IA).....	188	60.2	203	46.9	38	33	429	50
Symptomatic (Group IB).....	124	39.8	229	53.1	77	67	430	50
Total.....	312	100.0	432	100.0	115	100	859	100

In a given tuberculous patient symptoms depend on (1) local disturbance of pulmonary tissue and pulmonary function and (2) systemic reaction to metabolites from the infection. The indolent nature of developing pulmonary tuberculosis allows time for some adaptation of tissue to occur. The dilatory nature of this disease, the adaptability of living tissue to the disease, and the tremendous functional reserve of the lungs account for failure or delay in the development of symptoms from tissue alteration caused by the disease. Because the multiple bronchial drainage from all areas of the lungs allows expectoration of the tuberculous exudate, the retention of metabolites of the infection is decreased and systemic reaction to the disease is postponed. Table 3 shows the distribution of symptoms in Group I.

TABLE 3.—*Distribution of symptoms in Group I*

Symptom	Quantitative classification					
	Minimal (312 patients)		Moderately advanced (432 patients)		Far advanced (115 patients)	
	Number	Percent	Number	Percent	Number	Percent
Cough	95	30.4	166	38.4	70	60.9
Loss of weight	35	11.2	99	22.9	48	41.7
Fatigue	14	4.4	28	6.5	15	13.0
Night sweats	5	1.6	21	4.9	15	13.0
Chest pain	18	5.8	58	8.8	14	12.2
Hemoptysis	14	4.4	27	6.2	9	7.8
Anorexia	5	1.6	12	2.8	5	4.3
Weakness	5	1.6	6	1.4	2	1.7
Pleurisy with effusion	8	2.6	9	2.1	2	1.7

The high percent of patients with significant symptoms in which the patient was unaware of his condition until the routine roentgenogram of his chest was made is astonishing. Inquiry concerning the patients' apparent disregard of symptoms elicited numerous rationalizations such as (1) cigarette cough, (2) sinus trouble, (3) bad air, (4) damp air, (5) poor ventilation, (6) poor food, (7) poor preparation of food, (8) hot living and working compartments, (9) overwork, (10) poor dining facilities, (11) nose bleed, (12) bleeding gums, (13) strain, (14) cold, (15) grippe, and (16) fear of not being released from the military service. In nearly every instance the patient apparently reported honestly that he did not regard his symptoms as sufficiently important to require medical advice. For comparison, table 4 shows the symptoms of the patients of Group II who sought medical aid and were thereupon hospitalized.

TABLE 4.—*Distribution of symptoms in patients admitted on basis of recognized symptoms (Group II)*

Symptom	Severity of disease					
	Minimal (53 patients)		Moderately advanced (173 patients)		Far advanced (99 patients)	
	Number	Percent	Number	Percent	Number	Percent
Cough	41	74.5	151	86.3	90	90.9
Loss of weight	19	34.5	85	48.6	66	66.7
Fatigue	11	20.0	51	29.1	29	29.3
Night sweats	6	10.9	30	17.1	21	21.2
Chest pain	27	49.0	81	46.3	51	51.5
Hemoptysis	16	29.0	77	44.0	37	37.4
Anorexia	5	9.0	22	12.6	12	12.1
Weakness	5	9.0	20	11.4	12	12.1
Pleurisy with effusion	9	16.4	8	4.6	1	1.0

TABLE 5—Comparison of percent of patients in Group IB and Group II showing various symptoms

Symptom	Quantitative classification					
	Minimal		Moderately advanced		Far advanced	
	Group IB (124 patients)	Group II (55 patients)	Group IB (224 patients)	Group II (175 patients)	Group IB (77 patients)	Group II (59 patients)
Cough	76.6	74.5	74.1	86.3	90.9	90.9
Loss of weight	28.1	34.5	44.2	48.6	62.3	66.7
Fatigue	11.3	20.0	12.5	29.1	19.5	29.3
Night sweat	4.0	10.9	9.4	17.1	19.5	21.2
Chest pain	14.5	49.0	16.9	46.3	18.1	51.5
Hemoptysis	11.3	29.0	12.1	44.0	11.7	37.4
Anorexia	4.0	9.0	5.4	12.6	6.5	12.1
Weakness	4.0	9.0	2.7	11.4	2.6	12.1
Pleurisy with effusion	6.4	16.4	4.0	4.6	2.6	1.0

Patients in Group IB showed rather close correspondence in the incidence of specific symptoms with patients in Group II as shown in table 5.

### CONCLUSIONS

Of 859 patients discovered by routine roentgenograms of the chest 50 percent were asymptomatic. 36.3 percent were classified as minimal whereas only 16.7 percent of those hospitalized on the basis of symptoms were so classified. Of the patients discovered by routine roentgenograms 50 percent had symptoms which were not recognized by them as significant.

Of those recognized by routine roentgenograms asymptomatic patients constituted 60.2 percent of the minimal cases, 46.9 percent of the moderately advanced, and 33 percent of the far advanced. The symptoms manifested by the patients conformed to the expectations of current opinion. Public health programs directed to discovery of unrecognized tuberculosis should be continued and expanded. The lay public requires further education in the significance of symptoms.





# Damage to the External Iliac Artery

## Report of a Case

H. Haskell Zipserman, Major MC, U. S. A. (1)

Vincent DeCiulla, First Lieutenant, MC, U. S. A. (1)

THE literature is filled with case reports of satisfactory surgical results. Only occasionally does the poor result or the surgical error find its way into the literature. A report of poor results and surgical errors and the means used to correct them is invaluable because it adds to the surgical armamentarium and may serve to prevent death or disability.

## CASE REPORT

A 22-year-old white soldier was admitted to this hospital for repair of a left indirect inguinal hernia of about 18 months' duration. He was taken to surgery on 24 January 1951 at which time a hernia repair using Cooper's ligament was undertaken by another member of the surgical service. During suture of the transversalis fascia to Cooper's ligament the external iliac artery just proximal to the inguinal ligament was inadvertently torn by the suture needle. Pressure over the puncture failed to control bleeding, so the vessel sheath was opened revealing a 2 mm laceration of the artery. Because pressure with oxycel gauze for 5 minutes failed to control bleeding, one of us (H. H. Z.) was called on for assistance. The iliac artery above and below the tear was isolated and circled with two moistened umbilical tapes to control hemorrhage. In the absence of arterial suture, a 6-0 eye suture with a swaged on cutting edge needle was used to place a single everting mattress suture through the rent in the arterial wall. Release of the umbilical tapes above and below this point revealed no bleeding from the rent but a small amount of bleeding was noted at the site of entry of the everting suture. This was easily controlled by oxycel gauze placed against the arterial wall.

Inspection of the involved segment of iliac artery before closure revealed a marked degree of segmental spasm but pulsations of the

(1) U. S. Army Hospital, Fort Dix, N. J.

femoral artery were noted below the inguinal ligament. The dorsalis pedis pulsations were palpable in both feet and the skin temperature and color of both feet were equal. The patient was returned to the convalescent ward where shock blocks were placed under the head of the bed. Four hours after operation, intermittent heparinization was begun by the intravenous injection of 50 mg. of heparin every 4 hours. The clotting time was checked at intervals by the Lee and White method and varied from a normal of 9 minutes to a maximum of 66 minutes (the average maximum being about 33 minutes). Maximums above 30 minutes were reduced by intravenous injection of 5 cc. (50 mg.) of protamine sulfate.

About 5 hours after the return of the patient to the ward, it was noted that his left foot was markedly colder and paler than the right and that the previously palpable left dorsalis pedis pulsation was absent. Using the technic described by Curbelo (2) a peridural block was accomplished. A 16-gauge Touhy needle with a Huber point was used to introduce a 3.5-gauge French ureteral catheter (x-ray type) into the peridural space between the twelfth thoracic and the first lumbar vertebra with the patient in the lateral recumbent position and his back acutely arched. The only modification of the original technic was that a syringe filled with air instead of fluid was used to indicate when the spinal needle entered the peridural space. Theoretically a negative pressure is set up in the peridural space with the patient's back bent or flexed. A change is noted in the compressibility of the air in the syringe when the peridural space is entered. The technic is similar to a subarachnoid tap except that the needle is advanced only a millimeter at a time in order not to pierce the dura. Once it has been ascertained that the needle has entered the peridural space the ureteral catheter is inserted in a cephalad direction (this is facilitated by the Huber point on the needle), and the needle is withdrawn. The catheter is then taped in place with adhesive. A 23 or 24 gauge needle is inserted into the catheter and a test dose of about 8 cc. of Curbel's anesthetic solution (3) is injected in order to be certain that the catheter has not pierced the dura. If no motor paralysis ensues then an additional 32 cc. of the solution is injected after waiting 5 minutes. About 10 minutes after the second dose the patient noted paresthesias in both legs and feet and said that he felt as if he had just entered from a cold surrounding and placed his feet close to a warm radiator. The color of the affected foot became pinker and there was a noticeable increase in its temperature. The affected foot was not however warmer than the unaffected foot. Within 1 hour skin temperatures of both feet were equal. After 2 hours the affected foot and leg gradually cooled until they began to show blanching. No dorsalis pedis or posterior tibial pulsation was pal-

(2) Marranon Curbelo M. Continuous peridural segmental anesthesia by means of ureteral catheter. *Anesth. & Analg.* 28: 15-23, Jan. Feb. 1949.

(3) This is made up by mixing 800 mg. of crystalline procaine, 40 mg. of procaine (4 cc. of 1 percent procaine), 0.5 cc. of 1:1,000 epinephrine and 36 cc. of distilled water or saline solution. The resultant volume is 40 to 45 cc. of anesthetic solution.

pable. After 3 hours a second dose of Curbelo's mixture was administered. Although no pulses were palpable in the left leg and foot venous distention was equal bilaterally and the skin temperature of both extremities was nearly equal. No motor paralysis occurred although sensory changes (anesthesia and hypalgesia) extended to the nipple line. Five hours after the second dose the foot had cooled again and it became apparent that it would become necessary to establish continuous rather than intermittent sympathetic paralysis.

A solution of 5 percent dextrose in distilled water was therefore made up with 0.4 percent procaine and 0.01 percent pontocaine. This solution was connected to the peridural catheter with a standard intravenous drip-bulb apparatus and a flow rate of about 35 drops per minute was established. At the end of 4 hours 500 cc. of solution had flowed into the peridural space. The patient complained of burning of both feet and of backache. It was presumed that the latter was caused by pressure in the peridural space. The drip was slowed to about 10 drops per minute and within 30 minutes the pain had subsided. A regimen was established wherein the drip would be speeded up until the foot was appreciably warmed and then the rate of flow would be reduced. This continuous drip was maintained for 4½ days. During this time a weak dorsalis pedis pulsation was only intermittently palpable on the left. At no time in this period was the posterior tibial pulsation palpated. On removal of the catheter the patient was allowed to walk. On ambulation the posterior tibial pulsation became weakly palpable and the skin temperature, skin color, and venous distention were equal bilaterally.

The ureteral catheter was left in place for nearly 5 days. During this period 4 liters of dilute Curbelo's solution and a total of 17.4 grams of procaine and 480 mg. of pontocaine were given in 2 doses. The patient vomited on two occasions, probably because of the toxic effect of the procaine. The vomiting was easily controlled with 0.25 gram of sodium amytal intravenously.

This patient returned from convalescent furlough on 24 February 1951 at which time there was no evidence of arterial pulsation below the iliac artery on the left. His skin temperature was equal in both feet. His skin color and venous distention were likewise equal bilaterally but he complained of moderate cramping of the left calf and thigh on long or rapid walking.

#### DISCUSSION

Postoperatively all efforts in this case were directed toward control of arterial spasm and the prevention of thrombosis at the site of arterial injury. That arterial spasm was present was proved by the fact that it was seen during the operation in spite of the vasodilating action of the spinal anesthetic and by the marked changes which occurred in the affected foot and leg when the spinal anesthetic wore off. Heparinization to prevent thrombosis may be performed either intermittently or

continuously. Continuous heparinization may be accomplished either with a continuous drip of heparin, by heparin in Pitkin's menstruum, or with depo-heparin. All of these methods are equally effective but the latter two and intermittent heparinization are more easily accomplished.

In order to overcome the obvious segmental arterial spasm, several methods of treatment were considered. These were paravertebral block of the affected side, continuous caudal block, or continuous peridural block. The latter was finally decided on because continuous sympathetic paralysis without muscle paralysis is produced by this method, because peridural block requires a smaller volume of solution to produce a higher level of sympathetic paralysis than with caudal block, and because the sensory anesthesia associated with peridural block is definite proof of sympathetic paralysis. No such proof of sympathetic paralysis exists when performing a paravertebral block. The rationale of peridural anesthesia in vasospastic conditions was suggested by Blanchard in a personal communication to Fruman and Apgar (4) in which he stated that he maintained functional sympathectomy in animals by continuous peridural block.

Failure to maintain adequate arterial circulation through the femoral artery in this case can be explained only by progressive thrombosis occurring at the site of injury associated with continued arterial segmental spasm. The collateral arterial circulation was dilated by the peridural block as proved by the bilaterally equal skin temperatures, skin color and venous distention. The presence of only intermittent pulsations of the arteries of the feet showed that a segmental spasm continued to exist. According to Shumacker (5) there are some instances in which functional sympathectomy fails to relieve such segmental arterial spasm because of the capacity of the arterial muscular coats to contract as a result of local stimuli independent of sympathetic innervation. Had peridural block been continued for a longer period, the segmental arterial spasm might ultimately have been relieved and the femoral arterial system would have remained patent. As it was, the collateral circulation was dilated by this functional sympathectomy allowing adequate circulation to the left foot and leg in spite of femoral thrombosis.

#### SUMMARY

A technique is described by which a functional sympathectomy was maintained for 4½ days in a patient who had a laceration of the external iliac artery with resultant spasm. No marked untoward effects were noted either physiologically or anatomically during or after the pro-

(4) Fruman, M. J. and Apgar, V. Continuous segmental epidural anesthesia with catheter via caudal canal; preliminary note. *Anesthesiology* 10: 733-735, Nov. 1949.

(5) Shumacker, H. B. J. Treatment of acute arterial occlusion. *Quart. Bull. Indiana Univ. M. Center* 13: 7-11, Jan. 1951.

cedure. It is hoped that the procedure will receive greater usage in the future in vasospastic conditions of the lower extremity especially following vascular operations. One of the authors (V. DeC.) has used the technic on several occasions in patients with arterial emboli of the lower extremity and in several with phlebitis. It is suggested that this procedure be used in patients with frostbite of the lower extremity because intense vasodilatation is produced. This technic may easily be combined with a bilateral continuous stellate ganglion block in patients who have frostbite of the upper and lower extremities.



# Dental Disease and Endocrinopathy

Harry L. Levin *Commander DC, U S N R.* (1)

**O**RAL manifestations of endocrine dysfunction often may be observed initially by the dentist. The hyperplastic teeth of the cretin and the tendency of the diabetic patient toward pathologic dental changes are well known. It is the duty of the dentist and oral surgeon always to be on the lookout for patients with endocrine disturbances. Objective manifestations such as exophthalmos in hyperthyroidism, obesity in diabetes and a protrusive massive jaw in acromegalia are easily recognized. The products of the endocrine glands exercise control over each other and also exert a tremendous influence on other organs. Thus the thyroid gland, whose hormone thyroxin influences the metabolic processes of the body is under the control of the pituitary gland. In diabetes four glands are involved, the pancreas, the adrenal, the thyroid, and the pituitary. The concept of correlated activity involving tissues remote from each other applies to all endocrine glands (2).

After this general introduction we may consider the effects of over and under secretion of each endocrine gland separately showing its influence on the development and maintenance of the health of the teeth and their supporting structures. Dentistry plays a minor role in the pathologic changes in the endocrine glands yet some knowledge of the pitfalls besetting the unsuspecting dentist or oral surgeon is necessary so that he may determine the proper treatment of oral manifestations of endocrine disease. Curettage of cystic cavities in the mandible as found in hyperparathyroidism is definitely contraindicated. Operation no matter how simple in diabetes mellitus without proper preliminary medication is dangerous. A knowledge is required of many other diseases in this category that occasionally come to our attention.

(1) U. S. S. Cabot.

(2) Seeringhaus E. L. *Endocrine Therapy in General Practice* 5th edition. Year Book Publishers Inc. Chicago Ill., 1945. p 14



## PITUITARY

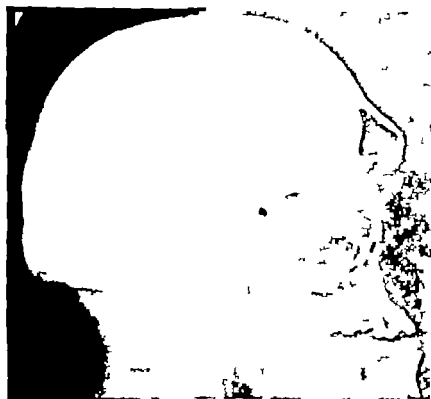
It has been proved by many authorities that removal of the pituitary in the dog results in delayed eruption of the teeth, short roots and wide pulp chambers. The foramina at the apex were also found to be comparatively wider than those found in the normal dog. Eosinophilic adenoma or hyperplasia of the neurohypophysis in the adult produces acromegaly. Although the mandible increases in size and decided prognathism, the size of the teeth remains unchanged. Dental plaster casts as well as repeated roentgenograms of the jaw will show the progress of the disease (figs. 1 and 2). Hyperactivity of the anterior lobe of the pituitary



Figure 1—Roentgenogram of jaw with acromegaly.

leads to renewed growth of the body and overgrowth of the entire skeleton, particularly the supra-orbital ridges, frontal sinuses and the lower jaw. The teeth are widely spaced and mastication becomes difficult. The administration of a general anesthetic is exceedingly dangerous and the tongue becomes enlarged and the thymus gland, which under normal conditions undergoes atrophy after puberty, continues to grow and may interfere with normal breathing. Persons with acromegaly usually develop diabetes in the later stage of the disease (3).

(3) Goldberg, M. B., and Lissner, H. Acromegalia, its course and treatment. *J. Endocrinol.* 2: 447-501 Aug. 1912.



*Figure 2 —The same patient, 8 years later. Note growth of mandible particularly at the ramus.*

### THYROID

Hypothyroidism may be congenital in origin and is characterized by premature ossification of the bones particularly those at the base of the skull. In children the bones of the face especially the jaw and nasal bones show a generalized retardation of growth and dental caries is prevalent. Dentition is delayed but the size of the teeth is not affected so that the teeth and the alveolar processes seem to be over large for the mandible and maxilla. The teeth are poorly formed and irregularly placed in the dental arch. Supernumerary teeth are present. Two rows of teeth may be seen. The head appears too large for the body and the cranium is relatively larger than the face. Bone development can be altered by early treatment in these patients. In those treated from early childhood craniofacial and dental development closely approach normal (4).

### PARATHYROIDS

The parathyroids are concerned with the calcium and phosphorus metabolism and these substances are necessary for the calcification

(4) Eagl, L. M. B.; Bronstein, L. P.; Bredie, A. G.; and Vok, P.: Roentgenographic cephalometric appraisal of untreated and treated hypothyroidism. *Am. J. Dis. Child.* 61: 1193-1214, Jan. 1941.

of the bones and teeth. In hyperparathyroidism calcium is not withdrawn from the teeth because resorption of calcium from a fully-formed tooth cannot occur. Hypersecretion of the parathyroid gland, caused by a tumor or hyperplasia, is the etiologic factor in the formation of bone cysts in the skeletal structures. Resch (5) noted that a child born of a mother with hyperparathyroidism readily developed caries and early loss of the deciduous teeth. This in turn resulted in malocclusion of the teeth with altered jaw development. Struck (6) stated that, in ex-



Figure 3.—Characteristic condition of hyperparathyroidism in mandible. A cystic area which closely resembles cyst of dental origin is absent. —Courtesy of Leroy M. Ezala, D. D. S.

treme demineralization of hyperparathyroidism, dental caries does not increase. This indicates that the resorption of calcium and phosphorus from mature teeth by way of the blood stream does not occur to a significant degree.

The oral manifestations of hyperparathyroidism may result in an early recognition of this disease. The dental signs are cysts of the jaw, osteoporosis, closely meshed trabeculae, and absence of the lamina dura around the roots of the teeth (figs. 3 and 4). In roentgenograms the lamina dura appears as a white line close to the black line which represents the periodontal membrane. The lamina dura should be examined for breaks in continuity because any roughening of its surface is indicative of a pathologic process. Erdheim (7) noted that, in parathy-

(5) Resch, C. A.: Dental findings in hyperparathyroidism in relation to patient and pregnancy; report of case. *Cleveland Clin. Quart.* 14: 147-152, July 1947.

(6) Struck, M. S.: Mouth in hyperparathyroidism. *New England J. Med.* 224: 1019-1023, June 12, 1941.

(7) Erdheim. In Selye, H.: *Textbook of Endocrinology*. Universite de Montreal, Montreal, Canada, 1942, p. 553.

roidectomized rats dentine that formed after the removal of the gland failed to calcify and the enamel was hypoplastic and irregular. The lack of dentine calcification is so characteristic of parathyroid insufficiency that it has been employed as an indicator in the bio-assay of the parathyroid hormone. If a parathyroidectomized rat is treated repeatedly



Figure 4—Hyperparathyroidism (osteitis fibrosa cystica).  
The mandible with cyst formation is shown.

at short intervals with small doses of parathyroid hormone rings of calcification corresponding to the treatment appear within the otherwise uncalcified dentine. When skeletal involvement is present, high levels of alkaline phosphatase may also be observed. Roentgenograms will reveal a generalized osteoporosis. Pathologic fractures occur frequently. The compact bone of the mandible is decalcified. In addition, there is definite thickening of the cortex of the mandible and large brown tumors composed of giant cells and cysts are present. The marrow of the bone is replaced by fibrous tissue in large areas.

#### PANCREAS

The pyorrheal teeth and gums of the diabetic patient are characteristic. A heavy calculus formation occurs around the necks of the teeth, the teeth become very sensitive because of the destruction of Sharpey's fibers and, as a consequence, the periodontium is parted, exposing the

roots of the teeth (8) and giving rise to periodontal disturbances. A ready flow of pus from the gingivas and through the dental papilla is noted. The gingivas become swollen and painful, the breath foul. Onset of gingivitis may be acute and the loosening of the teeth rapid. The tongue is deeply fissured, sometimes swollen and inflamed. The susceptibility of a diabetic patient to pyorrhea is a common characteristic.

Proper medical treatment sometimes will eliminate the need for a dental operation, but the need for oral hygiene is always present and is important. Under appropriate treatment the teeth may tighten in their alveoli and the inflammatory processes around the gingivas may abate but excessive deposits of calculus will persist and continued strict dietary control and proper therapy are required. Recent studies have shown that there are at least a million persons in the United States with undiagnosed diabetes. Hence dentists must always watch for these asymptomatic patients. Routine urinalysis should be performed preoperatively even if only a minor operation is contemplated. Dental caries is less prevalent in the diabetic than in the nondiabetic patient, but pyorrhea is much more frequent in patients with diabetes.

Beardwood (9) discussed in detail the role of dentistry in diabetes and listed six points to be considered before performing a dental operation: (1) the patient should be under the care of a physician; (2) local anesthesia should be used whenever possible although nitrous oxide-oxygen inhalation anesthesia is comparatively safe; (3) epinephrine should not be used for it is directly antagonistic to insulin and raises the blood sugar; (4) aseptic technique should be observed as diabetic patients are very prone to infection; (5) unnecessary trauma should be avoided; and (6) extensive dental treatment should be given in stages.

### GONADS

The noticeable increase of caries during puberty, pregnancy and lactation has been attributed to endocrine dysfunction. The concept that, in pregnancy, calcium can be withdrawn from the fully-formed tooth is erroneous but change in the gingiva does occur in puberty, pregnancy and just prior to menstruation. If oral hygiene is maintained the gingiva should return to normal at the end of these periods. Congestion and bleeding of the gingival tissues have been observed in association with gynecologic disturbances (10). In women who freckle and burn rather than tan when exposed to the sun's rays the gingivas may bleed after brushing and excessive bleeding may occur after extractions and minor operations. When no blood dyscrasia is present

(8) PEARCE, H., and GREENBERG, S. S. *Diseases of the Mouth and Their Treatment*. 2d edition. Lea & Febiger, Philadelphia, Pa. 1939.

(9) BEARDWOOD, J. T. Role of dentistry in management of diabetes mellitus. *Dental Cosmos* 75: 879-883, Sept. 1933.

(10) SELLER, C. J. Periodically transitory meso-gingivitis incidental to women. *J. Dent. Research* 13: 190, 1933.

this condition is suggestive of an endocrine disturbance (11) Dental caries and pigmentation of the gingival tissues in women are suggestive of an ovarian deficiency (12) Ziskin et al (13) produced hyperplasia of the gingival tissues following injection of estrogens experimentally in monkeys The work of Ziskin et al (14) on the effects of estrogens on the oral tissues has stimulated much interest in this phase of endocrinology

Accelerated tooth eruption occurs in the very young with hypergenitalism Complete dentition is reported to have occurred in 1-year-old infants with loss of deciduous teeth and replacement by the permanent set by the end of the third year (15) This condition (precocious puberty) is found in boys and may be caused by a testicular interstitial cell tumor (16) Secretion from the interstitial cells of the testes accelerates growth and development and premature calcification may occur Karnaky (17) reported a case of sexual precocity in a girl 4 years and 11 months of age The body development was that of a 12-year-old girl but the eruption of the teeth was unaffected and the deciduous teeth were all normal and intact An ovarian tumor was found

### ADRENAL

Accelerated dentition may occur in association with adrenal tumor (18) Retarded dental development has followed hypofunction of this gland (19) The dark pigmentation of the mucosa of the mouth and the bronzelike appearance of the skin over the entire body is characteristic of Addison's disease Dental disease in such patients should not be treated by the dentist alone (20) According to Soffer (21) pigmentation, if not a racial characteristic is indicative of Addison's disease Tooth extraction in an untreated patient may provoke an adrenal crisis with severe dehydration and shock Patchy pigmentation

(11) Lucia S. P. and Aggeler P. M. Simple easy bruisability pseudohemorrhagic disease is of probable endocrine origin J Clin. Endocrinol. 2: 457-459 July 1942.

(12) Rocco P. Estrogens and Pigmentation. Instituto de Medicina Montevideo Uruguay

(13) Ziskin, D. E.; Blackberg S. N. and Stout A. P. Gingiva during pregnancy experimental study and histopathological interpretation. Surg. Gynec. & Obst. 57: 719-726, Dec. 1933

(14) Ziskin D. E., Zagarelli, E. V. and Sennett, C.: Estrogen implant in dog; preliminary report. Ann. Orthodont. 3: 723-739 Oct. 1937

(15) Schoor L. Endocrines and teeth. J. Am. Dent. A. 21: 322-328, Feb. 1934.

(16) Wise A. A. and others: Pubertas preco in 6-year-old boy produced by removal of testis probably of interstitial cell origin. J Clin. Endocrinol. 2: 527-530 Aug. 1942.

(17) Karnaky K. J. Precocious sexual precocity in young girl. J Clin. Endocrinol. 5: 184-188, Apr. 1945

(18) Flatau W.: Endocrine Diseases The Blakiston Co., Philadelphia Pa.

(19) Wisel, J. Handb. d. norm. u. path. Physiol. 553: 16, 1930.

(20) McGavack T. H.; Benjamin, J. W. Speer F. D., and Klock S.: Malignant pheochromocytoma of adrenal medulla (paraganglioma); report of case stimulating carcinoma of adrenal cortex with secondary adrenal insufficiency J Clin. Endocrinol. 2: 532-538, May 1942

(21) Soffer L. J. Oral manifestation of endocrine disease Ann. Dent. 3: 34, June-Sept. 1941

of the mucosa within the mouth is not a constant sign in Addison's disease but when present is of great diagnostic value. It is seen on the lips, inner aspects of the cheeks, gums, hard palate, and uvula. Spotty pigmentation may be seen on the tongue in some patients. There are other diagnostic criteria but the most striking and characteristic is the general pigmentation of the skin which should invoke the suspicion of the dentist and oral surgeon alike for the prognosis in Addison's disease is always grave.

### BONE CYSTS

A solitary bone cyst of the mandible closely resembles cysts caused by hyperparathyroidism. Ruston (22) describing several such cysts points out the diagnostic differences. Dental cysts caused by endocrinopathy have no epithelial lining and show no evidence of infection. Bone cysts sometimes expand by a decrease in their fluid content and the increased pressure from within a cyst causes resorption of the bone around it. This decrease in the contents is explained by the unavoidable disturbance of the circulation in the immediate neighborhood of the primary cyst. According to Weinmann and Sicher (23) a vicious circle is established, the cyst causes stasis and diffusion of the plasma or tissue fluids in the cavity and its increased growth perpetuates its own circulatory disturbances.

### CONCLUSIONS

Disorders of the glands of internal secretion produce certain oral, dental, and systemic changes. The dental officer must be alert to recognize these manifestations if he is to avoid certain pitfalls in dental treatment. Dental treatment in endocrine disorders is collateral and must be done in cooperation with a competent internist or endocrinologist.

(22) Rushmer, M. A.: Solitary bone cysts in mandible. *Brit. Dent. J.* 81: 37-49, July 1946.

(23) Weinmann, J. P., and Sicher, H.: *Bones and Joints*. C. V. Mosby Co., St. Louis, Mo., 1947.

# Deterioration of Silicate Cements in the Tropics<sup>(1)</sup>

Theodore E. Fischer *Lieutenant Colonel, U S A F (DC)*

Irl C. Schoonover (2)

**T**HE EFFECT of temperature and humidity on the setting time of silicate cements has been observed in dental offices and research laboratories for many years. Experience has shown that the use of a warm slab for mixing the cement and the increase in water content of the liquid caused by a high relative humidity produce a more rapid reaction between the powder and liquid and accelerate the setting process. Normally therefore in tropical areas where temperatures and humidities are high, silicate cements set too rapidly and make proper manipulation difficult or impossible. This difficulty can be and apparently is obviated in practice by using less than the usual amount of powder in order to obtain a workable consistency and overcome the rapid setting. This practice however results in a mixture of less than the standard powder liquid ratio with its resultant loss of essential physical properties such as a decrease in hardness and compressive strength, and an increase in staining solubility and shrinkage.

In World War II an entirely different problem was encountered by many dentists stationed in tropical areas throughout the world. Contrary to what was expected, the setting of silicate cements in the Tropics was seriously delayed and in some areas retarded to the extent that restorations from these materials had to be abandoned completely. At the time the military services were at a loss to explain this peculiar phenomenon, and no scientific explanation or correction of this difficulty was available. Consequently large stocks of silicate cements that had been transported to these areas were discarded or disposed of resulting in not only a huge monetary loss but also a waste of critically needed shipping space.

Dental supplies sent to tropical areas during the war were exposed to excessively high temperatures (as high as 149° F) in the holds of ships and during storage under canvas or in metal huts. The Ware-

(1) This investigation was conducted as part of the cooperative research program between the National Bureau of Standards and the Army Dental Corps.

(2) Chief Dental Research Section National Bureau of Standards.



housing Division of the Army Quartermaster Corps and the Navy's Bureau of Ships reported that temperatures of 175° to 180° F in the sun are recorded at certain places in the Tropics. Storage temperatures under canvas or in metal hornments registered around 145° to 160° F. Daytime temperatures approximated 130° F in the shade and 110 to 125° F in offices; nighttime temperatures ranged from 100 to 110° F. Thus it is reasonable to assume that dental supplies remained at a temperature of approximately 145° F for at least a month while in transit and for much longer periods of time in storage dumps or depots.

Evidence that deterioration occurred under these conditions was seen in the appearance of the packages received at dental installations in the Tropics. The boxes in which the powders and liquids were packed were stained and a crystalline precipitate was often present around the neck of the bottles of liquid, indicating that an actual leakage had occurred. Often the liquid was discolored to a brown hue making proper shade selection impossible. Plastic molded caps were frequently loose when received. Many bottles of silicate liquid were disposed of because of these failures alone. It was believed that the long exposure to high temperatures caused by slow shipping in convoys and improvised warehousing facilities might account for the deterioration of silicate cements and explain why their behavior in wartime use was so different from that normally observed in tropical areas. To investigate this possibility the following experiments were conducted.

TABLE 1—*Loss of weight (water) / liquid in original containers stored at 61° C. (142° F.)*

Cement	Percent loss				
	24 hours	48 hours	72 hours	2 weeks	1 month
A	0.19	0.27	0.35	6.14	11.83
B	0.17	0.24	0.39	1.43	2.16
C	0.37	0.50	0.66	1.35	1.79
D	0.15	0.26	0.32	3.04	3.99
E	0.17	0.22	0.41	1.01	1.32
F	0.15	0.21	0.42	1.39	1.86
G	0.19	0.27	0.44	1.68	2.68

Several sealed bottles of each of the silicate cement liquids which appear on the American Dental Association List of Certified Dental Materials were carefully weighed and placed in an oven at 61° C. (142° F.), some in an upright and some in a horizontal position. The weights observed during this procedure are given in table 1. Other samples of the same cement liquids were stored in a constant temperature room maintained at 21° C. (70° F.) and 60 to 70 percent relative humidity. The effect of storage at the elevated temperature was noted by observing the conditions of the containers and weighing the bottles.

at definite intervals of time. The data in table 1 show that in 24 hours the average loss in weight of the various samples ranged from 0.15 to 0.37 percent, depending on the brand of the cement liquid. As the time of storage at 61° C. increased, the average loss in weight showed a wide variation, ranging from 1.01 to 6.14 percent at the end of 2 weeks. During this time 2 of the samples of one brand of liquid were dropped from the study because of the leakage of most of the liquid caused by extrusion of the cork. After storage of the samples for 1 month at this temperature the average weight loss varied from 1.32 to 11.88 percent. In addition to the loss in weight and volume it was observed that caps were loosened, corks were extruded, a precipitate had formed around the necks of the bottles, and the liquid in several of the samples that were cork sealed had discolored to varying shades of brown. No discoloration was seen in bottles sealed without the use of cork. All of the external appearances of the bottles of liquid that were observed in the Tropics were duplicated during the time these liquids were held at the simulated tropical temperatures in the laboratory.

At the end of the heating period mixtures were made from the overheated cements and from the cements stored under normal conditions. In each case the mixing technic and the powder-liquid ratio used were determined according to American Dental Association Specification No. 9 for dental silicate cement. The setting time of each cement investigated was determined. Again the same conditions observed in the Tropics prevailed; the setting time for any cement that had been heated was delayed. This increase in the setting time was directly related to the amount of weight loss observed for the sample.

It is apparent from these experiments that the retarded setting of silicate cements is associated with loss in weight of the liquid occurring during storage at elevated temperatures. Loss of liquid, however, does not explain the delayed setting, for if leakage alone occurred the remaining liquid should react normally when mixed with the powder. If, however, the decrease in weight was caused by evaporation of water from the liquid, this loss would materially affect the physical properties of the cement.

To determine whether retarded setting was caused by evaporation of water from the liquid, the exact amount of weight loss of the liquid was calculated and this amount of distilled water was then added to the respective samples of liquid. Mixtures were again made and the setting times determined. The normal setting time established for each cement prior to heating was regained. These experiments indicate that the delayed setting of silicate cements in the Tropics was caused by loss of water from the liquid during storage and/or shipping at elevated temperatures. The excessive heat caused an expansion of the air and the liquid in the bottle, as well as an expansion of the plastic caps and a loosening of the cork seal sufficient to allow a loss of water by evaporation. Therefore, when these liquids were received by the dentist for use, enough water had been lost to seriously delay the setting time.

During this work it was observed that some cements were more susceptible and reacted more critically to a loss of water than others. To determine the variation in setting times of the different cements caused by either a loss or a gain in the water content of the liquid, a second series of experiments was made. New samples of all the cement liquids were exposed to elevated temperatures in open bottles and water was evaporated from them until water losses of 2, 5, 10, 15, and 20 percent by weight were attained. At the same time a sample of each liquid was carefully prepared with increments of 2, 5, 10, and 15 percent water by weight added to each bottle of liquid respectively. These prepared solutions were covered with a thin film of mineral oil to prevent a further gain or loss of water, as suggested by Paffenbarger et al. (3) and were stored at a constant temperature of 21° C. (70° F.).

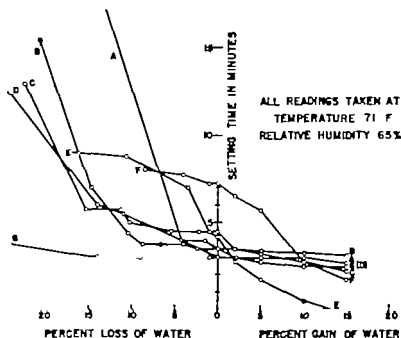


Figure 1

Several mixtures of cement were made from each sample of prepared liquid, as well as from samples of untreated liquid, until an average setting time for each brand of cement was determined. The powder-liquid ratio for untreated cement was used. The results of these determinations are given in figure 1. These experiments were repeated on additional samples of the same cements used in the above experiments.

(3) Paffenbarger, G. C., Schoenover, L. C., and Sender, W. Dental cements: physical and chemical properties and specification, J. Am. Dent. A. 25: 32-37 Jan. 1938.

except that mixing was done under simulated tropical conditions of  $33^{\circ}\text{C}$  ( $92^{\circ}\text{F}$ ) and 90 percent relative humidity. The results are shown in figure 2.

It will be observed from the curves in figures 1 and 2 that a certain percent of water can be gained or lost by several brands of silicate cement without adversely affecting the setting time. Conversely with some brands of cement a slight change in water content of the liquid seriously affects the setting time. It will also be observed that mixing of the cements at the elevated temperature and humidity decreased the setting time of all the cements and in the case of the untreated liquids to such an extent as to make most of them unusable. Although mixing under these conditions increased the speed of setting of some

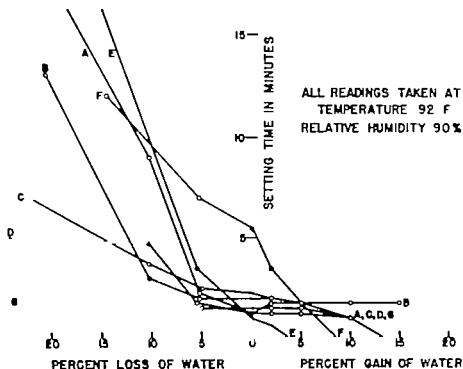


Figure 2

of the cements sufficient to permit their use in dental practice. It will be shown in the following experiment that other essential properties were adversely affected.

Test specimens were prepared from the brands of cement most affected and least affected by water loss and water gain (E and G in figs 1 and 2) using the powder-liquid ratio for untreated cement. Crushing strengths of these specimens were determined according to the method described in American Dental Association Specification No. 9 for dental silicate cement. The data given in table 2 show that there was an appreciable change in strength with a change in the water

content of the liquid. For all liquids having from 2 to 15 percent loss of water there was a reduction of strength. The strengths were slightly greater for the samples with 2 percent water added but additional increases in water caused the strengths to decrease rapidly.

TABLE 2.—Crushing strength in pounds per square inch versus water loss and water gain

Cement	Normal crushing strength	Percent water loss			Percent water gain		
		2	5	15	2	5	15
E	24,850	24,650	18,100	15,150	26,300	21,200	Too rapid set
G	27,200	23,400	20,900	12,750	27,800	24,700	9,000

In the foregoing experiments it has been demonstrated that the physical properties of silicate cements are adversely affected by slight changes in the water content of the liquid and that the loss of water by evaporation was the predominant factor in the deterioration of these materials in the Tropics. To eliminate these difficulties either a more efficient container must be designed or the facilities for transporting and storing dental materials must be improved so as to protect silicate cements from prolonged exposure to elevated temperatures. To avoid the difficulty encountered during the mixing of silicate cements in the Tropics a packaging device to insure a proper mixture under any atmospheric conditions would be ideal. The development of such a device being studied at the National Bureau of Standards.

TABLE 3.—Loss of weight (water) of liquid under oil film at temperature of from 62° to 65° C.

Cement	Percent loss in		
	1 week	2 weeks	1 month
Bottles capped			
A	0.33	0.43	1.52
D	0.47	0.76	1.65
G	0.40	0.61	1.41
Bottles open			
A	0.48	0.79	1.74
D	0.84	1.48	2.73
G	0.57	0.88	1.73

Until such device is developed, however, a practical means of preserving the water balance of silicate liquid in the dental clinic wherever adverse atmospheric conditions exist is the method referred to above for maintaining the prepared samples for testing. Of the two methods suggested by Paffenbarger et al. the one using a film of light

mineral oil floated on the surface of the silicate liquid is the most adaptable to clinical use. The efficiency of this method of protection was tested with the results shown in table 3. A few drops of light mineral oil were floated on the surface of the liquid. One group of bottles was exposed to temperatures of  $62^{\circ}\text{C}$  ( $144^{\circ}\text{F}$ ) with the caps removed and the other group was exposed to the same temperature with the bottles tightly capped. It can be seen from the data in tables 1 and 3 that although oil on the surface of the liquid is not an adequate barrier to evaporation when the liquid is exposed to a temperature of  $62^{\circ}\text{C}$  for a long time it does retard the evaporation process.

9.5 rear seat (which was unoccupied). The aircraft suffered extensive wrinkling of the metal tail surfaces—most marked on the right. The starboard wing light and the starboard gas tank cap were lost. A standard anti-buffet plastic helmet, weighing 25 pounds, was worn during the flight. After returning to the base the pilot experienced slight pain in the left side of his neck. This pain was thought to be caused by muscular strain and responded readily to heat treatment. Anteroposterior and lateral roentgenogram of the upper thoracic and cervical spines were taken. They revealed the vertebral bodies in normal position and the interspaces were well maintained. The films were interpreted as normal. All symptoms subsided within 2 days following the flight and the pilot resumed his regular duties.

On 9 August he occupied the rear seat of a jet aircraft and was subjected to about 3 g's during routine training maneuvers. Following this flight he noticed a mild recurrence of the pain in the left side of



Figure 1 —Patient wearing locally-fabricated cervical collar

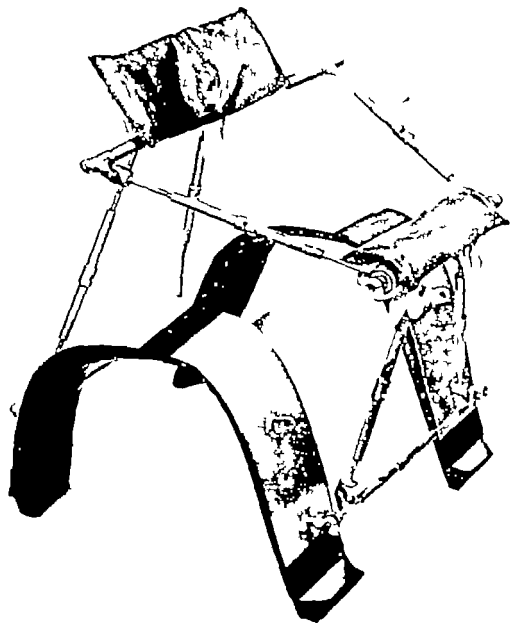
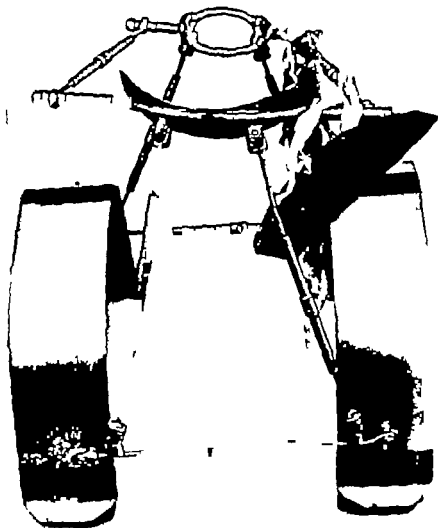


Figure 2.—Cervical collar fabricated in an air squadron machine shop.

the neck. Thinking this pain would disappear he made a second flight the same afternoon. He wore his standard anti-buffet helmet during each flight. The pain became severe following this flight and tenderness to pressure was noted over the insertion of the left trapezius muscle. On 10 August roentgenograms of the cervical spine including oblique views revealed a simple fracture of the left superior articular processes of the fifth and sixth cervical vertebrae without displacement and without overriding.

The pilot was admitted to the U S Naval Hospital Key West Fla. where cervical traction was applied using a haker pulley and 5-pound weight. A locally fabricated adjustable cervical collar (figs 1 2 and





*Figure 3—Structural details of chin and occiput rests shown by partial removal of padding.*

3) replaced the traction on 11 August. Reasonable comfort and full ambulation was accomplished. On 18 August commercial cervical collar was procured and replaced the previous device. The chin rest of this collar was more comfortable than that of the one improvised. On 22 August the patient was allowed to stay at home while remaining on the sick list. Convalescence was uneventful and on 2 October he was returned to duty.

On 26 October pain in the left side of the neck recurred and was noted on 2 successive days. On 27 October reexamination of the cervical spine by x-ray revealed almost complete obliteration of the fracture

lines of the superior articular facets of the fifth and sixth vertebrae on the left. This was interpreted as stable union. On 10 November it was recommended that this pilot be restricted to flying multiengine aircraft with safety pilot. The Bureau of Medicine and Surgery concurred in this recommendation.

### DISCUSSION

It is anticipated that this pilot may return to unrestricted flying duties after an appropriate interval, free from recurrence of symptoms. Although he does not recall his helmet striking any part of the cockpit, or excessive motion of his head, it is apparent that unusual forces were sustained. The weight of the anti-buffet helmet, added to the weight of the pilot's head may have contributed to the forces and consequent muscular effort in producing the trauma.

The collar constructed in a squadron machine shop made no pretense to beauty but proved to be functionally satisfactory. Its somewhat cumbersome appearance was caused by the use of 8 turnbuckles and 11 universal joints. These items salvaged from completely disabled aircraft allowed full adjustment and precluded failure to fit. The medical officer who devised the collar and the metalsmiths who constructed it were all inexperienced in this type of work and wished to insure a fit at the first trial. Two shoulder strips each 25 by 18 inches were formed of corrosion resistant steel sheet 0.045 inch thick to fit the patient. Three steel studs and one eyebolt were silver soldered to the steel strips for attachment of the turnbuckle spreaders front and back. An oval chin rest was made by bending a  $\frac{1}{4}$  inch steel rod and a small preventer was welded to either side of this rest to insure stability of the chin in the rest. An occipital rest was formed from sheet steel and silver-soldered to a formed steel rod occipital spreader. Turnbuckles were installed for chin-to-occiput adjustment with 2 universal joints at the ends of the right turnbuckle. Four vertical turnbuckles with universal joints at each end were installed by silver-soldering to turnbuckle shafts of front and back chest spreaders and to chin and occiput rests. The turnbuckles permitted ready, easily accomplished adjustment both for original fit and for subsequent modification of position and tension.

Two studs were silver-soldered to the front of the shoulder strips cephalad to the front spreader. These were intended for use in maintaining the shoulder strips in place by means of elastic bands. In practice this tension was found to be unnecessary. Also it was found on fitting that the entire structure was too flexible. The 2 upper front and the 2 lower back universal joints were then silver-soldered into immobility correcting this defect. Wing nuts were employed at the front of the right chin-to-occiput member and at the junction of the front spreader with the right shoulder strip permitting the collar to open hinging on its universal joints to facilitate fitting and removal.

Pads of orthopedic felt were covered with plastic upholstery material and secured in place using electricians tape for securing to the shoulder straps and ties of blinding tape for securing to the chin rest and occipital rest. These pads were prepared in the parachute loft. The chin rest was made more comfortable by using a doughnut-shaped pad which distributes the pressure. As a final gesture the metalsmiths who constructed the device applied a coat of quick-drying aluminum paint. These men were quite proud of their work and of the expedition with which it was fabricated, displaying marked interest in the progress of the patient, and visiting him to inquire as to the adequacy of the collar. The collar no longer required by the patient, is now a part of the equipment of the crash ambulance ready for emergency use in transporting any suspected injury to cervical vertebrae.

# Q Fever

Harvey H. Waldo Major MC, U S A. (1)

**Q** FEVER is an acute specific, rickettsial disease of man. It is characterized by sudden onset fever malaise headache and a pneumonitis demonstrable on roentgenograms. It can easily be misdiagnosed as influenza or atypical pneumonia. Derrick (2) first reported 9 cases of this newly recognized clinical entity occurring in Queensland, Australia. He names it Q fever. Since then the disease has been found to be widespread. In this article two serologically proved cases of Q fever occurring in the same family are presented and the importance of considering the disease in the diagnosis especially of what appears to be atypical pneumonia is emphasized.

## CASE REPORTS

**Case 1**—A 38-year-old white thin nervous housewife was admitted to this hospital on 17 November 1948 complaining of occipital headache stiff neck, chills and fever which began about 48 hours previously. She was seen by a physician who made a diagnosis of flu and prescribed some tablets. On the following day after a poor night's sleep the symptoms were aggravated. Later in the day there was an episode of photophobia, diplopia and blurred vision lasting about 1 hour. This was followed by the appearance of an occipital headache and a stiff neck. The temperature taken by her husband, was elevated. During the day prior to admission the symptoms were intensified. The patient was seen that evening by a medical officer from the outpatient department, and hospitalization was advised. Previous personal history was not significant except that 6 months earlier the patient had been in bed for 3 months because of pain in the right ankle. She had received sulfonamides and was told that she had rheumatic fever.

Physical examination on admission revealed some nuchal rigidity and a positive Kernig's sign bilaterally. The temperature was 103° F the pulse was 96; respirations were 20 and the blood pressure was 105/75. Except for slight dehydration the remainder of the physical examination was essentially negative. A lumbar puncture revealed

(1) Walter Reed Army Hospital, Washington, D. C.

(2) Derrick E. H. "Q" fever, new fever entity: clinical features, diagnosis and laboratory investigation. *M. J. Australia* 2: 281-299 Aug. 21, 1937.

normal dynamics and fluid. Urinalysis was negative. Blood smears were negative for malarial parasites. There were 9 700 white blood cells with 80 percent neutrophils, 19 percent lymphocytes, and 1 percent eosinophils. The initial impression of the medical officer of the day was that the patient had objective evidence of meningeal irritation, but the cerebrospinal fluid was clear and that a virus involvement, such as lymphocytic choriomeningitis, should be considered.

During that day and the next the patient's temperature ranged between 101° and 106° F (Fig. 1). Serial blood cultures taken on admission showed no growth. A pelvic examination was made with difficulty

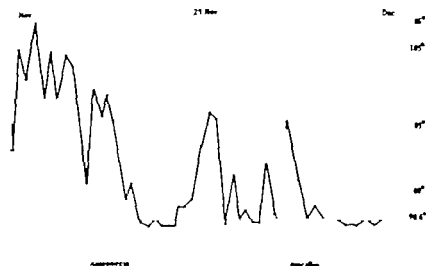


Figure 1—Case 1. Temperature chart showing response to streptomycin therapy. (Recurrence of fever may have been caused by secondary infection.)

because of exquisite tenderness. The uterus seemed slightly enlarged, and a mass 4 by 2 cm. was felt in the rectum. Proctoscopy revealed no mucosal abnormality or mass. Stool cultures, typhoid, paratyphoid, and dysentery agglutinations were negative. The sedimentation rate was 21 (Wintrobe).

The day following admission a roentgenogram of the chest revealed an area of mottled infiltration in the upper lobe of the right lung. This had the appearance of an acute inflammatory process, but neoplastic disease was listed as a possibility (Fig. 2). On this day it was discovered that the basement room of the patient's house was rented by a research physician who worked in the Q fever laboratory of the National Institutes of Health, Bethesda, Md. The patient cleaned his room, laundered his towels and bedding, and had occasional social contact when the owner visited the couple upstairs in the evening. A presumptive diagnosis of Q fever was made and streptomycin therapy was started. One gram was given initially and 0.5 gram was given every

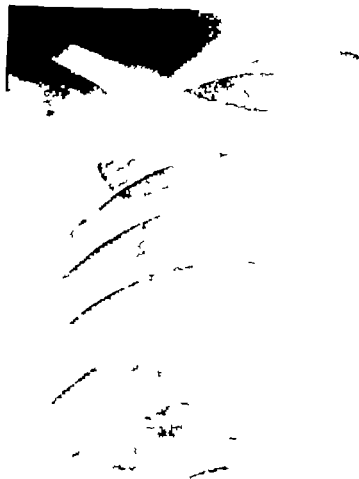


Figure 2.—Case 1 Roentgenogram of chest taken on admission.

4 hours thereafter. The temperature fell to normal by lysis within 2 days. This was accompanied by definite relief of symptoms. The available supply of aureomycin was exhausted in 4 days. Three days thereafter the temperature again began to rise. This was accompanied by a leukocyte count of 14 500. The patient was then given 50 000 units of penicillin every 3 hours and the temperature returned to normal but spiking occurred occasionally during the following week. The symptoms were relieved but marked weakness and increased nervousness persisted for about 2 months.

An initial complement fixation titer for Q fever determined on 26 November the eleventh hospital day was 1 160. Two weeks later the titer had increased to at least 1 640 (no end point was reached). Ten months after the illness the titer was 1 80. A specimen of blood taken 7 years after the illness showed a decrease in titer to 1.20. Tests for cold agglutinins and psittacosis and lymphogranuloma venereum on 26 November were negative. The titer with OX19 and OX2 on the same day were both 1 40.

*Case 2*—A 44-year-old white man was admitted to this hospital on 16 December 1948, the day following the discharge of his wife (*Case 1*). He had felt well until the evening before admission when he experienced the sudden onset of malaise, dizziness, and frontal and occipital headache. The headache was relieved by salicylate. His temperature was 101° F. During the night the headache recurred, keeping him awake. In the morning he felt so weak that he could hardly walk. He reported to the dispensary and was advised to report to the hospital. He had no cough, chest pain, or nasal discharge.

Physical examination on admission was negative except for the finding of crepitant, inspiratory rales in the right axillary line. His temperature was 102° F, his pulse was 80, and his respiration were 20. A roentgenogram of the chest taken on the morning of admission revealed a fine diffuse infiltration involving the right costophrenic region and the lateral aspect of the base of the right lung (fig. 3). This



*Figure 3*—*Case 2*. Roentgenogram of chest taken on admission.

was interpreted by the radiologist as pneumonia type undetermined. The leukocyte count was 10 750 with 69 percent neutrophils 23 percent lymphocytes 4 percent monocytes and 4 percent eosinophils. Urinalysis was negative. The sedimentation rate was 30 (Wintrobe).

Headache remained the patient's principal complaint but most of the time he refused any medication for relief. Within 48 hours he felt much better but still complained of weakness and headache. He was afebrile within 72 hours without any form of specific therapy (fig. 4).

16 Dec

22 Dec

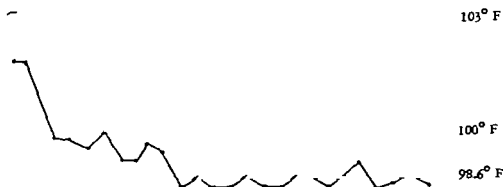


Figure 4 — Case 2. Temperature chart showing mild course of the disease.

Cough or chest pain were never significant. Some headache and weakness persisted for 3 weeks. Because Q fever was immediately suspected serologic tests were made early. The complement fixation titer for Q fever was 1:10 on the second and twelfth hospital day but on the fifteenth day it was 1:40, and on the nineteenth day it was 1:160. After 9 months the titer was 1:40 and after 2 years it had returned to 1:10.

#### COMMENT

Q fever in these two patients has shown a variance in its severity. The patient treated with aureomycin seemed to respond well to this drug. The second patient required no specific therapy for prompt recovery. The apparent exacerbation of the disease in the first patient 3 days after the discontinuance of aureomycin may have represented a secondary infection as indicated by the leukocytosis and the response to penicillin. In both patients a diagnosis of influenza could well have been made in the absence of x-ray facilities. With films showing pulmonary infiltration, a diagnosis of atypical pneumonia would have been logical. One patient was initially diagnosed flu, and later was suspected of having meningitis. Serologic studies established the definitive diagnosis in these two cases. It is to be emphasized that it is



good practice when the diagnosis is in doubt to take a blood specimen which may be kept refrigerated. This specimen may never be used, but if later serologic studies are made this initial specimen will be available for comparison.

#### SUMMARY

Q fever is a rickettsial disease which may easily be overlooked or misdiagnosed. It is to be suspected in each case characterized by sudden onset of malaise, fever, headache, and pulmonary infiltration. A definitive diagnosis can be made only by serologic studies.

# Dental Centroscope

Francis W Shaffer Major DC, U S. A. (1)

THE establishment of the centric relation once the vertical dimension has been determined is a problem that faces most prosthodontists. This problem is difficult especially when a marked protrusion or retrusion is present. Some routines of fixation of the centric relation are by means of (1) lines drawn on the wax rims and the rims luted together with wax (2) the use of paper clips which are pressed in the rims across the occlusal plane and (3) notches cut on the top of the occlusal plane of one rim and on the opposing rim a softening of the wax which is compressed into the notches on closure. As all these methods are being used the problem of rechecking the centric relation in the mouth creates a margin for error in judgment.

A small template (fig 1) with sliding triangular guides was devised in this laboratory to aid in overcoming some of these problems. For lack of a better name the template was called a "centroscope". The centroscope is versatile and can be made to conform to all normal and most abnormal jaw relationships without losing the centric relation for articulating purposes once the bite rims have been removed from the mouth.

The centroscope is luted with wax to the upper bite rim after the vertical dimension has been established (fig 1). By means of the lock out in the middle of the centroscope the two posterior triangular guides can be moved in or out backwards or forward to conform to the ridge shape and locked there once the correct position has been determined. The occlusal surface of the lower rim is warmed slightly with a Hanau torch and a tentative closure is made into the lower rim to see if the triangular guides are in the position required by the operator. If not the guides can be adjusted to contact the lower rim in the proper areas (bicuspid-molar area). The triangular guide on the front of the centroscope is fixed permanently and needs no adjustment.

When the two posterior guides are adjusted the indentations left by the guides on the rims by the tentative closure are softened at least 4 mm and the patient is instructed to close in centric relation. The various techniques for accomplishing this closure are left to the discretion of the operator. After the wax has cooled enough so that the lower bite

(1) Fifth Army Central Dental Laboratory St. Louis Medical Depot, St. Louis Mo.

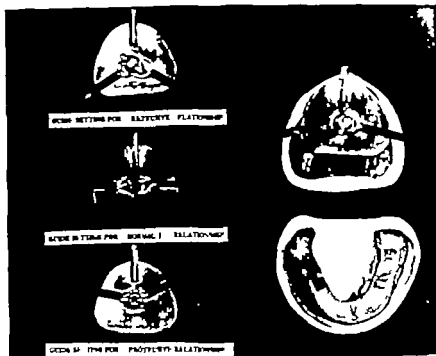


Figure 1

rim can be removed. It is removed and checked carefully to see if clean, sharp indentations have been made. If any doubt exists as to whether or not the centric relation is correct the lower rim is chilled thoroughly and inserted in the mouth. The patient then is re-instructed to close into centric occlusion several times and if this is correct, he will close innumerable times on the indentations previously made.

Once the centric occlusion has been found to be correct the models can be placed on an articulator by means of this centric relation as determined by the centroscope. It is advisable to lock the rims together before mounting the models. One can go further with this centric relation by making two new sets of bite rims out of quick-cure acrylic on the articulated models and mounting a check-bite appliance. With the check bites that are obtained all the condylar inclinations necessary for further perfection of balanced occlusion can be determined. All full dentures should have balanced occlusion in all ranges of excursive movement and can only be obtained with a good initial centric and a scientific technique of determining all condylar elements of movement.

# Primary Pigmentary Degeneration of the Retina

## Report of Five Cases

Norman Youniss *Captain, MC, U S A. (1)*

**P** RIMARY pigmentary degeneration of the retina or retinitis pigmentosa is a not uncommon disease in the military age group. The diagnosis can be suspected from the history and easily confirmed by examination of the eyegrounds. The prognosis and unfavorable course are not sufficiently appreciated. The purpose of this article is to review the pathology, diagnosis and prognosis in this disease. We have recently seen four patients with this disease and one with the much rarer related condition, retinitis punctata albescens at this hospital.

### CASE REPORTS

**Case 1** — This 22-year-old man had complained of night blindness for 10 years. Consanguinity, a common finding in the family history of these patients, was present as his parents were cousins. Although the patient had a physician's note stating that his brother and he had been examined and found to have incipient retinitis pigmentosa, he was inducted by his local board. Examination in the eye clinic revealed vision, O D 20/40 (corrected), O S 20/30 (corrected). No abnormalities were seen externally or with the slit lamp. The optic disks and vessels were normal but the periphery of the retina showed scattered irregular deposits, typical of pigmentary degeneration of the retina. The superior, inferior and nasal fields were limited to 20° bilaterally. The right and left temporal field was nearly normal in extent but each contained a scotoma.

**Case 2** — This 23-year-old man had served in the Army previously and been discharged to the Enlisted Reserve Corps. He had suffered from poor night vision for many years and more recently had noted difficulty seeing even in daylight. His mother was virtually blind from

(1) U. S. Army Hospital, Fort Dix, N. J.

retinitis pigmentosa and his brothers and sisters were said to have some degree of visual disability. His vision was O. D. 20/25 (corrected) and O. S. 20/25 (corrected). He had a mild bilateral blepharitis. Slit lamp examination was negative. Retinoscopy revealed a marked vitreous haze bilaterally, attenuation of all the large vessels, especially the arteries, and advanced pigmentary changes throughout the fundi of both eyes. There was concentric contraction of the visual fields to 15° in all quadrants bilaterally.

**Case 3**—This 20-year-old man had had poor night vision and falling central vision for many years. He had served in the Army for 19 months and had been given pills, possibly vitamin A, and glasses but no improvement of vision was noted. He believes his parents are "distantly" related. Examination in the eye clinic revealed vision: O. D. 20/50 (corrected), O. S. 20/60 (corrected). No abnormalities were seen externally or with the slit lamp. There was a vitreous haze bilaterally. The

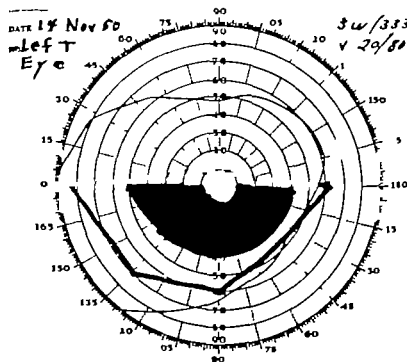


Figure 1—Case 3 Visual field of left eye.

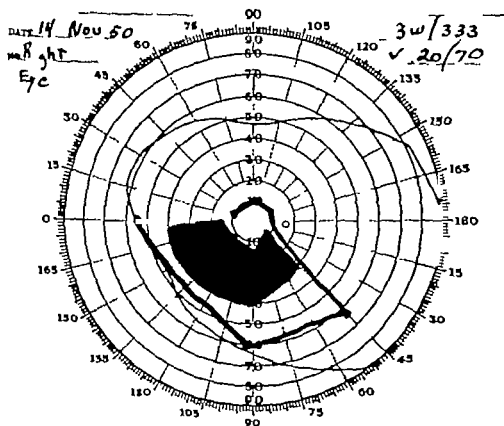


Figure 2.—Case 3 Visual field of right eye

optic disks showed an early waxy atrophy bilaterally. Marked attenuation of all the vessels and many large irregular deposits of pigment were seen. There was complete loss of the superior visual fields bilaterally. The inferior fields were slightly contracted and showed large ring scotomas (Figs 1 and 2).

**Case 4**—This 23-year-old man had noted night blindness for as long as he could remember. He had been to physicians and received glasses which did not help him and which were discarded. He received similar treatment in the Army. He had six siblings two of whom also had night blindness. His vision was O D 20/30-1 (pin-hole) and O S. 20/30 (pin-hole). Early bilateral posterior cortical cataracts were seen with the slit lamp. The optic disks showed early waxy atrophy bilaterally. Sclerosis of the retinal vessels was moderately advanced. Peripheral retinal areas were covered with typical irregular deposits of black pigment. The visual fields were reduced to 20° in all quadrants except

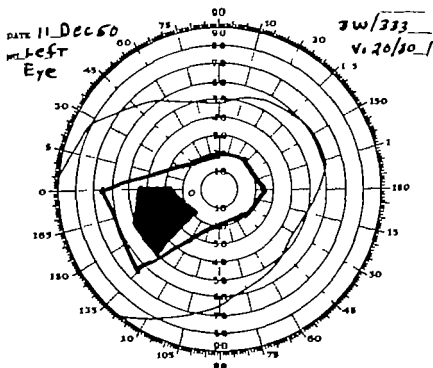


Figure 3.—Case 4. Visual field of left eye.

for passing of the temporal field which extended to 60° and contained ring scotomata (figs 3 and 4)

*Comment.*—All but one of these four patients showed relatively good central vision although they had surprisingly large field defects. The field defects, visual loss, and fundus changes were remarkably symmetrical in both eyes. All the patients had been treated by glasses and some by medication without a funduscopic or visual field examination. Consanguinity of parents was suggested in two of the family histories and three had siblings who were affected.

*Case 5*—This 21-year-old man had a rare form of primary degeneration of the retina, known as retinitis punctata albescens. His only complaint was night blindness since early childhood. His eyegrounds showed innumerable small white round dots in the retina. These were widely scattered through the fundus on a plane deeper than the vasa.

Night blindness is present in these patients from an early age but the visual deterioration is stationary or very slowly progressive. Some

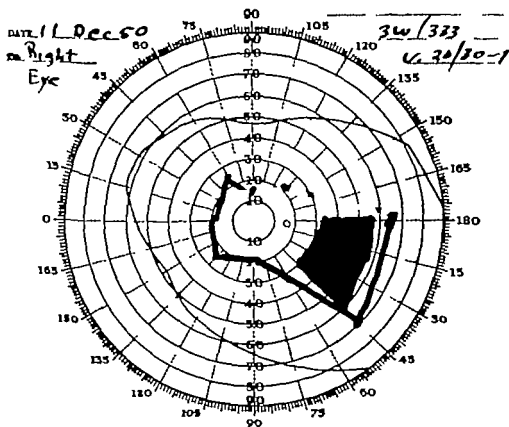


Figure 4 —Case 4. Visual field of right eye.

later develop retinitis pigmentosa as well (2). Visual acuity and fields in this patient were normal I had an opportunity to examine his brother a member of the Naval Reserve and he had identical findings

#### DISCUSSION

Primary pigmentary degeneration of the retina is a hereditary disease which is characterized pathologically by degeneration of the retinal neuro-epithelium. The signs and symptoms usually do not appear until the second decade despite its heredofamilial background Clinically the progression of symptoms is as follows (1) night blindness (2) progressive loss of peripheral fields of vision (3) loss of central acuity and (4) eventual blindness. The first visual elements to degenerate are the rod cells of the peripheral retina. The pigment epithelium then deteriorates releasing pigment which migrates into the retinal tissue and is deposited in spidery clumps along the retinal vessels. Later vascular sclerosis occurs in the retinal arteries and veins (2) (3).

(2) Duke-Elder & S. Text book of Ophthalmology Vol 3 The C. V. Mosby Co. St. Louis, Mo. 1940 pp 2765-2786.

(3) Elwyn, H. Disease of the Retina The Blakiston Co. Philadelphia Pa. 1946. pp 250-280.



## 5 X-ray

## 6. Implantation of placental tissue subconjunctivally

Patients with retinal pigmentosa should not be inducted in the service because it is a waste of government funds. Frequently these patients are trained and promoted into responsible positions many of which require acute night vision and it is only then that their condition is discovered. Most of these patients could be screened out at the induction centers on the basis of history and funduscopic examination. Such an examination should not ordinarily take more than 30 seconds. The incidence is not high enough to warrant the taking of night vision, dark adaptation, fields of vision, et cetera at induction centers.

# Hexamethonium (C6) in the Management of Causalgia

John C. Rose *First Lieutenant, MC, A. U. S.* (1)

J. y N Wemple *First Lieutenant, MC, A. U. S.* (1)

THE availability of new drugs renews the possibility of the medical management of causalgia or at least its alleviation prior to surgical treatment. As an adjunct to a study conducted by Freis and coworkers (2), a new drug (3), hexamethonium (C6) (manufactured as hexamethonium bromide or hexamethonium iodide) has received a preliminary clinical trial in the treatment of causalgia complicating peripheral nerve injuries occurring in 10 battle casualties.

Hexamethonium is a recently introduced hexane derivative of polymethylene bistrimethyl ammonium which preliminary data has indicated to be a potent autonomic ganglion blocking agent (4) (5). Using skin temperature responses as a basis for comparison Flinnerty and Freis (6) have shown that the vasomotor effect of C6 given intravenously is greater and more prolonged than that of either priscoline or tetraethyl ammonium intravenously. Severe postural hypotension (lowering of blood pressure while erect but not while recumbent) has been the only significant side effect noted by these investigators.

(1) Neurosurgical Section, Walter Reed Army Hospital, Washington, D. C.

(2) Freis, E. D., Schaepe, H. W., Johnson, R. L., Rose, J. C.; and Flinnerty, F. A., Jr. Clinical evaluation of hexamethonium, a new ganglionic blocking agent; preliminary report. Presented at the Southern Society for Clinical Research, New Orleans, La., 27 January 1951.

(3) Limited distribution and not yet released for general use at the time this article went to press.

(4) Posen, W. D. M. and Zaimis, E. J. Clinical potentialities of certain bisquaternary salts causing neuromuscular and ganglionic block. *Nature* (London) 162: 810 Nov. 20, 1948.

(5) Bari, C. C. and Graham, A. J. P. Pentamethonium and hexamethonium iodide in investigation of peripheral vascular disease and hypertension. *Brit. M. J.* 1: 455-460, Feb. 25, 1950.

(6) Flinnerty, F. A. J. and Freis, E. D. Experimental and clinical evaluation in man of hexamethonium (C6), a new ganglionic blocking agent. *Circulation* 2: 828-836, Dec. 1950.

The patients on whom this study was made were recent casualties from Korea with penetrating wounds of the extremities. An upper extremity was involved in 6 patients and a lower extremity in 4. In each patient, at least one major nerve trunk was injured, as tabulated in table 1. At the onset of this study all 10 patients had severe causalgia. The pathogenesis of this syndrome and the criteria for its diagnosis have been reviewed in several recent publications (7) (8) (9).

The onset of causalgia varied from almost immediately following injury to 4 weeks after injury. The common factor to all was severe burning pain in the hand or foot. Other aspects of this syndrome—trophic and temperature changes and emotional factors—varied and ranged from none to those displayed by a patient howling apprehension and protecting a swollen, profusely sweating warm glossy dusky and markedly hyperesthetic hand or foot.

Hexamethonium bromide was administered both intravenously and intramuscularly to 11 of these patients except 2 of whom one received the drug only intravenously and the other received it only intramuscularly. The usual dose was 50 mg. Slight but probably insignificant increases in this dose were occasionally used. Placebos (steril water) were also administered to these same patients and in the same manner as was the drug during the course of treatment. All 10 patients were normotensive and their ages ranged from 18 to 23 years. The drug was routinely given with the patient flat in bed without a pillow. This position was maintained for a period of at least 90 minutes and blood pressures were taken periodically following each injection. The effects on the blood pressure varied from none to a maximum of 30 mm. drop in both systolic and diastolic readings. There was symptomatic postural hypotension in one instance (Case 3). The drug was discontinued in 9 because of nausea. No other patient became nauseated because of the drug and none vomited.

Thirteen of the patients in this study received one or more intra-arterial injections of 50 mg. of priscolline in the affected extremity. It had been the previous experience of this neurosurgical section that priscolline given orally and intravenously was without significant effect in causalgia and that intra-arterial injection of the above dose in most cases, resulted in immediate and complete relief of pain for from one-half to two and one-half hours. Arterial injection is occasionally difficult in wounded extremities. It is often impractical.

Seven of these patients subsequently required sympathectomies for permanent relief of pain. The dorsal sympathectomies performed were

(7) Liss, S. E. *Pain Mechanisms*. The Macmillan Company, New York, N. Y. 1944.

(8) Shumacker, H. B. J. Causalgia; general discussion. *Surgery* 24: 485-504, Sept. 1948.

(9) Echlin, F. Owens, F. M. Jr., and Ellis, W. L. Observations on major and minor causalgia. *Arch. Neurol. & Psychiat.* 62: 183-203, Aug. 1949.

TABLE 1—Average relief of pain obtained from therapy

Case	Age (years)	Nerve Injured	Location	Relief with				
				Placebo	Pri collin intra-arterially	C6 intravenously	C6 Intramuscularly	Sympathectomy
1	18	Common peroneal	Knee	None		Complete for 2 hr	Complete for 6 hr	Complete; no recurrence
2	21	Ulnar and median	Arm	Slight for $\frac{1}{2}$ hr	Complete for $1\frac{1}{2}$ hr	Complete for $1\frac{1}{2}$ hr	Complete for $\frac{1}{2}$ hr	Complete; no recurrence
3	23	Ulnar and median	Forearm		Complete for $\frac{1}{2}$ hr		None	Complete; no recurrence
4	20	Brachial plexus				Partial from 5 to 24 hr		Complete; no recurrence
5	19	Sciatic	Thigh	None	Complete for 24 hr partial for from 1 to 6 days	Complete for 30 hr partial for 7 days recurrence milder		Complete; no recurrence
6	18	Brachial plexus		None		Complete for $2\frac{1}{2}$ hr	None	Complete; no recurrence
7	18	Sciatic	Thigh	None		Complete for 2 hr	Complete for from 2 to 4 hr	
8	20	R distal median and ulnar	Arm	None			Complete for 1 hr	Complete; no recurrence
9	19	Sciatic	Thigh	None			Complete for 1 hr	Complete; no recurrence
10	23	Ulnar and median	Arm	Partial for $\frac{1}{2}$ hr			Complete for 1 hr	Complete; no recurrence

Complete relief for 40 minutes with 300 mg of hexamethonium intravenously for 1 hour

preganglionic in type with section of the rami communicantes of the second and third dorsal sympathetic ganglia and the sympathetic chain between the third and fourth dorsal sympathetic ganglia. The second and third intercostal nerves including the dorsal root ganglia were avulsed from the neural canal. In lesions of the lower extremity the second and third lumbar sympathetic ganglia with the intervening chain were excised. The operation on Case 10 resulted in an incompletely sympathectomized upper extremity. In this case the rami of the third and fourth sympathetic ganglia had been sectioned as indicated by postoperative roentgenograms which revealed resection of the fourth instead of the third rib.

The following are five representative cases in this series abstracted to recount the course of their therapy. Average responses to drugs and surgery are summarized in table 1.

### CASE REPORTS

*Case 1*—An 18-year-old soldier was wounded in the left knee and popliteal space on 7 September 1950, incurring damage to the common peroneal nerve. Three weeks following injury he began to have severe burning and stinging pain over the lower third of the leg and dorsum of the foot with minimal trophic changes. Repeated intravenous doses of 50 mg. of C6 resulted in immediate freedom from pain lasting 2 hours. Placebos gave no relief. On 5 October he began a 4-day course of 50 mg. of C6 intramuscularly every 6 hours. Complete relief lasted 4 hours with the first two injections and until the next dose for the remainder of the 4 days. Identical causalgic pain recurred on 13 October.

He was given 300 mg. of tetrathylammonium chloride intravenously which relieved the pain completely for 40 minutes. Narcotics were then required. He then began a 5-day regimen of C6 intramuscularly and for 5 days remained completely free of pain. Pain of the same intensity recurred within 12 hours of cessation of the drug. A left lumbar sympathectomy was performed on 1 November and has resulted in complete freedom from pain.

*Case 2*—A 21-year-old soldier sustained wounds of the right arm and forearm with complete ulnar and partial median nerve paralysis on 25 July 1950. Early in August he experienced constant burning pain in the right hand which was still present when he was examined on 11 September. At that time the right palm was mottled, dusky and cool. In the ensuing 2 weeks the patient received 4 intra-arterial injections of 50 mg. of priscolline in the right brachial artery with relief for 1½ hours with each injection. On 9 October 50 mg. of C6 given intravenously resulted in freedom from pain for 1½ hours. A 2-day course of C6 intramuscularly every 6 hours was begun, and each injection gave relief for one-half hour. Doses of 60 mg. on the second day did not improve the response. Placebos afforded slight relief for 30 minutes. On 18 October he had a right dorsal sympathectomy and

since that time has had complete and lasting free  
a markedly increased range of motion in the hand

Case 3 —A 23-year-old soldier was struck in  
16 July 1950 incurring a chip fracture of the  
the median and ulnar nerves. After healing of his  
early in October revealed a dusky, warm, and painful  
with severe and constant burning pain, particularly  
distribution. He was placed on a 2-day course of 50 mg  
early every 4 hours with no relief accompanying  
fainted momentarily on arising 1½ hours following o  
quired narcotics. When he was given 50 mg of pris  
brachial artery there was immediate relief of the burning  
followed by an intense recurrence. A right dorsal sy  
formed on 31 October resulted in complete and lasting freedom from  
pain, return of the appearance of the hand to normal and increased  
dexterity

Case 5 —A 19-year-old soldier incurred a wound of the left thigh  
with incomplete sciatic neuropathy on 10 September 1950. In  
following injury he noted severe burning pain over the dorsum of  
foot which persisted unchanged until treated. The skin over the  
foot was glossy, cool, and moist. On 27 September, 50 mg of priscoline  
injected in the left femoral artery gave immediate and complete relief  
of pain and partial return of the appearance of the foot to normal for  
24 hours. The syndrome recurred unchanged in 48 hours. On 29 Septem  
ber the same intra-arterial dose of priscoline gave the same pro  
nounced relief and the pain did not recur in its former intensity for a  
period of 1 week. The foot did not revert completely to its abnormal  
appearance. On 4 October, 50 mg of C6 given intravenously produced  
complete relief for 30 hours followed by nearly complete relief for  
7 days. The pain recurred at about one-half its former intensity. A  
placebo was without effect. On 11 October an intramuscular dose of  
C6 produced complete relief for 1 week followed by a recurrence of  
the pain. Two additional intramuscular doses of C6 weekly produced  
complete relief for that period and each was followed by a milder  
recurrence.

Case 8 —A 20-year-old soldier incurred wounds of the left arm and  
anterior chest wall on 28 July 1950. There was incomplete radial,  
median and ulnar nerve paralysis with severe burning pain, increased  
sweating and extremely severe hyperesthesia of the left hand starting  
almost immediately after injury. On 20 October he was given 50 mg  
of C6 intravenously with immediate and complete freedom from pain  
and hyperesthesia for 3 hours and partial relief for 3 more hours. The  
following day a 3-day course of 50 mg of C6 given intramuscularly  
every 6 hours was started. The dose was increased to 70 mg on the

fourth day. Each administration of the drug gave complete freedom from pain, sweating and hyperesthesia for from  $2\frac{1}{2}$  to 3 hours and partial relief until the next dose. The increased dose did not improve the response. Interposed placebos were ineffectual. On 25 October a left dorsal sympathectomy was performed. This has resulted in the complete cessation of pain and hyperesthesia.

### DISCUSSION

These cases illustrate the range of responses to C6 in causalgia. Relief of pain varied from none to complete freedom from pain as long as intramuscular injections were given every 6 hours. No explanation can be given for this variation in response to the drug despite uniform

benefit from sympathectomy. The relation of intravenous to intramuscular administration of the drug is also inconstant. No patient received regularly spaced intravenous injections of C6, but all intramuscular injections were given at 6-hour intervals for prolonged periods. It appears that intravenous doses usually gave more relief and for longer periods than intramuscular doses but the advantages of regularly spaced intramuscular doses outweigh the benefits of the intravenous use of the drug.

The response of causalgia following peripheral nerve injury to C6 in this small series was temporary and palliative. The drug seemed to be of benefit. Sympathectomy however remains the treatment of choice for most patients and specially for those not showing a permanent response to medical therapy. Further study is necessary before the drug can be fully evaluated in the treatment of causalgia, but certain possibilities for its clinical use suggest themselves. In the milder and the subsiding cases C6 may shorten the course of causalgia as indicated by the milder recurrences seen in 2 of the patients in this series following its use. C6 may also find a place in the maintenance of relative comfort for the patient awaiting sympathectomy. With less reliability it may aid in distinguishing causalgia from other painful states of the extremities which will not respond to sympathectomy.

### SUMMARY

Hexamethonium (C6) has received a brief clinical trial in the treatment of 10 patients with causalgia complicating peripheral nerve injuries. Five cases illustrating various responses to the drug are abstracted, and some comparisons drawn between C6, intra-arterial procaine and sympathectomy. A favorable response to C6 occurred

9 out of 10 cases though sympathectomy was required in 7 out of 10 cases for complete and lasting relief of pain. There is evidence that C6 may deserve further consideration in the management of this syndrome.

# Bronchiolitis in Infancy<sup>(1)</sup>

## Clinical Study With Special Emphasis on the Cardiac Complications

Arvin T. Henderson *Lieutenant, MC U S N.* (2)

S. R. a n z w e g M. D.

THE refractiveness to treatment of a syndrome seen only in infants and generally called bronchiolitis is in contrast to the advances in chemotherapy. Early clinical bacteriologic recognition of various respiratory disorders is imperative if full advantage is to be taken of the advances in both specific and adjunctive therapy. Bronchiolitis must be separated from other acute respiratory diseases because recovery depends almost entirely on symptomatic treatment and nursing care. Bronchiolitis derives its name from the fact that the greatest pathologic changes occur in the bronchioles although, like other respiratory diseases, the entire respiratory tract is involved. The areas chiefly affected appear anatomically to lie between the large airways and the alveoli and, in this respect, bronchiolitis can be likened to such conditions as asthma or the pneumonitis of pertussis.

It has never been proved conclusively whether bronchiolitis is a specific disease caused by a specific organism or whether it is merely an anatomic diagnosis. The causative agent is unknown. Over the past 40 years this disease has been described under such terms as peribronchiolar pneumonia, capillary bronchitis (3), interstitial bronchopneumonia (4), pneumonitis, and obstructive emphysema (5). Blake and Cecil (6) were able to produce a peribronchiolar infection by introducing pure cultures of *Hemophilus influenzae* into the respiratory tract.

(1) From the Department of Pediatrics, Children's Hospital, Detroit, Mich., and Wayne University College of Medicine.

(2) Now on duty at U S Naval Hospital, San Diego, Calif.

(3) Brennemann, J.: *Practice of Pediatrics*. W. F. Prior Co., Inc., Hagerstown, Md. 1947, p. 163.

(4) McCullum, W. G.: *Pathology of pneumonia in U S Army camps during the winter of 1917-1918*. Rockefeller Institute, New York, 1919.

(5) Nelson, W. E., and Smith, L. W.: Generalized obstructive emphysema in infant. *J. Pediatr.* 26: 36-55, Jan. 1945.

(6) Blake, F. G., and Cecil, R. L.: Production in monkey of acute respiratory disease resembling influenza by inoculation with bacillus influenzae. *J. Exper. Med.* 32: 691-717, 1920.



and McCordock (7) produced mural bronchiolitis by placing canine distemper virus into the trachea of a dog and following it 2 days later with pyogenic bacteria. Goodpasture et al. (8) examined the lungs of infants who died of bronchiolitis and found inclusion bodies in the epithelial cells of the bronchioles. From this he incriminated a virus as a causative agent. Mitchell and Nelson (9) believe acute bronchiolitis to be caused by agents acting synergistically or by one superimposed on the other.

Though the stereotyped course and the tendency to occur in circumscribed outbreaks suggests a specific agent, the syndrome may merely represent the infant's response to a prevailing organism which in older persons elicits only mild upper respiratory symptoms. The clinical difference between the manifestations in infants and in older persons could be attributed to the relatively thinner and less rigid thoracic cage, to the tendency for predominately abdominal breathing, to the relatively large amount of interstitial tissue in relation to bronchiolar and alveolar space and to the small lumen of the bronchioles.

A study has been made of 457 infants and children with bronchiolitis admitted to Children's Hospital, Detroit, Mich. Of these 102 were observed between 15 December 1948 and 20 April 1949. Because the policy of Children's Hospital is to admit only seriously-ill patients, those with mild bronchiolitis were seldom hospitalized. This study therefore concerns a group of selected patients all of whom were seriously ill and in it we wish to review the clinical aspects of bronchiolitis and also to call attention to hypoxemia and cardiac involvement, two conditions which have not been stressed in previous studies.

Bronchiolitis is essentially a disease of winter and spring and the rate of hospital admissions parallels that of bronchitis and pneumonia. Ninety-five percent of the patients were below the age of 1 year. The incidence was highest in the 2-month age group although the youngest patient was 2 weeks of age and the oldest 3 years.

### CLINICAL COURSE

The clinical course is fairly constant and typical but has many variations. After a 1 to 7-day invasion period, characterized by upper respiratory tract inflammation, cough and increased rhinorrhea the respiratory rate increases and evidence of respiratory obstruction appears. Hoarseness and fever are not outstanding at this stage although the pulse be unduly rapid. Symptoms progress rapidly in severity within the next few days with frequent and distressing paroxysms of coughing. Wheezing is often audible from a distance. As these symptoms

(7) McCordock, H. A. Further evidence of virus nature of interstitial bronchiopneumonia. *Proc. Soc. Exper. Biol. & Med.* 30: 508-511 Jan. 1953.

(8) Goodpasture, E. W.; Ansbach, S. N.; Swenson, H. S., and Cotter, E. F.; Virus pneumonia of infants secondary to epidemic infections. *Am. J. Dis. Child* 57: 997-1011, May 1959.

(9) Mitchell, A. G., and Nelson, W. E. *Textbook of Pediatrics*, 4th edition. W. B. Saunders Co., Philadelphia, Pa. 1947.

increase in severity bronchiolar obstruction with resultant symptoms of hypoxemia becomes evident and restlessness and cyanosis may become severe: this is the stage in which most patients are admitted to this hospital. The course then varies with the severity of the disease and the treatment instituted. In most patients the cyanosis and restlessness disappear and the patient progressively recovers.

Signs of cardiac distress and electrocardiographic evidence of myocardial damage appeared in several of our patients although in even the more severe and more stubborn cases there was usually a steady turn for the better. In 5 percent of our series signs of hypoxemia increased and death occurred from 1 to 6 days after hospitalization.

### PHYSICAL EXAMINATION

Physical examination during the first phase reveals the usual signs of upper respiratory infection such as rhinorrhea and injected nasopharyngeal mucosa. As the condition progresses respiratory difficulty increases and the rate becomes rapid. The soft parts of the chest retract with inspiration and the auxiliary respiratory muscles are brought into action. Air exchange is poor and expiration prolonged. On percussion the chest is tympanitic. The ribs are farther apart and more horizontal than usual. On auscultation the breath sounds are diminished in intensity, often wheezing in character, and appear quite distant.

Rales are heard throughout the chest with rales of a high-pitched musical character audible on expiration. Moist bubbling may be transmitted from the bronchi and trachea but is muffled by the peripheral emphysema. Signs suggestive of consolidation are migratory: these are caused by transient obstruction of the bronchioles with small areas of atelectasis which tend to disappear quickly. The heart rate is more rapid than expected and in severe cases is frequently over 200. There is an apparent decrease in the area of cardiac dullness because of the emphysema. The heart sounds appear distant and muffled and frequently a gallop rhythm can be heard. The liver edge usually is found one or two fingerwidths below the costal margin. This may be caused by flattening of the diaphragm or by enlargement of the liver secondary to venous congestion. We found abdominal distention to be a problem only rarely.

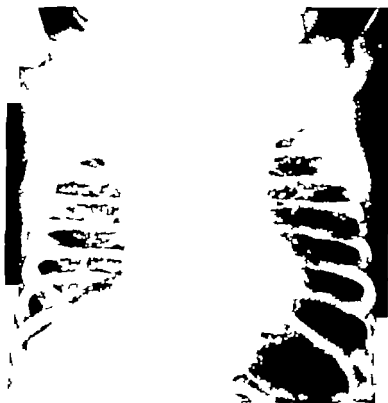
TABLE 1 —*Distribution of peak temperatures*

<i>Temperature peak (degrees F)</i>	<i>Percent</i>
Under 100	20
100.1 to 101	16
101.1 to 102	32
102.1 to 103	10
Over 103	20

In our series temperatures varied from normal to 105° F with 68 percent being below 102° F. The height of the fever was not always found to be a measure of the severity of the illness. Many of our most

critically ill patients had a normal temperature and some less ill had high fever (table 1).

Roentgenograms of the chest at the height of the disease show signs of bilateral generalized emphysema. The bronchovascular markings may be increased and near the bases and close to the hilar portions patches of atelectasis and infiltration may be noted. The diaphragm is flattened and depressed and a limitation of excursion can be noted on



*Figure 1—Roentgenogram of a 3-month-old female infant, taken on the third hospital day. Consolidation and atelectasis are seen in the right upper lung field. Elsewhere the lung fields are emphysematous and the leaves of the diaphragm are flattened.*

fluoroscopy. Usually there is no abnormal change in the shadow of the trachea. The heart size is in most cases smaller than one would expect from the clinical cardiac signs (10) (figs. 1 and 2).

(10) Paul, L. V. Roentgenologic diagnosis of acute bronchiolitis (capillary bronchitis) in infants. *Am. J. Roentgenol.* 45: 41-49 Jan. 1941.



Figure 2.—Roentgenogram of the same infant taken 6 weeks later. Pneumonic infiltration, atelectasis, and emphysema have disappeared and the contour of the diaphragm is normal.

### PATHOLOGY

In the past 3 years 9 patients with the clinical features of bronchiolitis died and autopsies were performed. In 2 of these although the diagnosis was bronchiolitis at autopsy it was found that other conditions accounted for death (one had congenital heart disease and the other had fibrocystic disease of the pancreas) and therefore they are not included. A study of the other 7 revealed great variation in the pathologic findings as opposed to the rather characteristic clinical picture (11). Common gross findings were patchy atelectasis and emphysema and various degrees of congestion. In 4 of the 7 patients mucoid material was found in the small bronchi.

The principal microscopic changes were found in the bronchioles but in some patients were also present in the bronchi; the walls were

(11) Bryan, A. M., Personal communication, Sept. 1949.

thickened by an infiltration of lymphocytes plasma cells and occasional polymorphonuclear leukocytes and by the engorgement of vessels in these regions. In some there were proliferative changes in the epithelial lining; not uncommonly it was thrown into folds either by the proliferation or by smooth muscle spasm. Some bronchioles showed only minor changes whereas others showed denuding and sloughing of the epithelial cells. The lumens in most cases contained some mucoid material polymorphonuclear leukocytes and cellular debris. Other lumens were clear or contained a little fluid. Inclusion bodies were sought in the epithelial structures but were not found.

Throughout the lung parenchyma the changes of patchy atelectasis and emphysema were apparent; bronchopneumonia was also present in one. In two there was a mild degree of patchy pneumonia chiefly peribronchial in distribution. In all autopsies it was noted that the alveolar walls were congested.

The changes found at autopsy in some but not all, of these cases were quite similar to those described as proliferative atypical bronchiolitis by Engel and Newns (12) who considered the causative agent to be a virus and believed that true pneumonia could develop as a consequence of the bronchiolitis and alveolar collapse. In view of the variability in the microscopic findings it is impossible to say just what the basic pathologic process is. Some had mucus plugs in bronchioles with practically no evidence of inflammatory process in the wall; others had marked inflammatory changes and thickening of the wall. Apparently infection from the bronchioles may spread to the nearby alveoli to give the findings of peribronchiolitis or interstitial bronchopneumonia.

Myocarditis, evidenced by an infiltration of polymorphonuclear leukocytes and monocytes in the myocardium in a small proportion of children dying of lobar and bronchopneumonia, has been described by Saphir and others (13). In our cases there was no cellular infiltration but in 4 of the 7 there was edema of the myocardium and in 3 there were degenerative changes in the nuclei of the muscle fibers evidenced by variability in size shape and staining qualities.

#### LABORATORY FINDINGS

Leukocyte counts on admission varied from 5 100 to 31 000 with most of the counts below 15 000. A lymphocytosis of over 50 percent was found in 59 percent and a neutrophilia in 41 percent of the patients. Under normal conditions a lymphocytosis is the rule in this age group. Twenty percent of the patients had a monocyte count above 6 percent and ranging up to 21 percent which was present in 2 patients. We are not stressing this latter point because of the variability with which various laboratory technicians differentiate between large lymphocytes and mononuclear cells and also because of the frequency of an in-

(12) Engel, S., and Newns, G. H.: Proliferative atypical bronchiolitis. *Arch. Dis. Child.* 15: 219-222, Dec. 1940.

(13) Saphir, O., Wile, S. A., and Reingold, L. M.: Myocarditis in children. *Am. J. Dis. Child.* 67: 294-312, Apr. 1944.

creased mononuclear count in this age group. As with the temperatures the height of the leukocyte count did not reflect the severity of the infection.

With the thought that the causative agent was a virus tests for cold agglutinins were made on 21 patients. In 16 the tests were negative in 2 agglutination occurred at a dilution of 1:64 and in 3 at a dilution of 1:32. The titers did not increase nor show correlation with the stage of the disease. Nose and throat cultures were made on all patients on admission on 1 blood and 2 chocolate plates. 1 of the latter was incubated at partial oxygen tension. No attempt was made to isolate a viral agent. From 84 percent of the cultures multiple organisms were grown. 11 percent showed only *Staphylococcus aureus* and 5 percent *Staphylococcus albus* (coagulase positive). As can be seen from table 2, the flora was found to be quite comparable with that found in apparently normal throats in the winter (14).

TABLE 2—Distribution of organisms in throat cultures

Organisms	Percent of patients with positive culture
<i>Staphylococcus aureus</i> .....	54
<i>Staphylococcus albus</i> .....	41
<i>Streptococcus viridans</i> .....	35
<i>Neisseria catarrhalis</i> .....	22
<i>Hemophilus influenzae</i> .....	21
<i>Escherichia coli</i> .....	15
<i>Diplococcus pneumoniae</i> .....	14
<i>Streptococcus haemolyticus</i> .....	13
<i>Pseudomonas aeruginosa</i> .....	2
<i>Neisseria meningitidis</i> .....	1

In 8 percent of the patients, blood cultures were found to be positive. *Diplococcus pneumoniae* was found in one and *Staphylococcus aureus* in the rest.

### ELECTROCARDIOGRAPHY

Ebert and Stend (15) and others have shown that the cardiovascular system is affected in many severe infections, often to a degree in which evidence of circulatory collapse is present. They concluded that it was not caused by loss of blood volume and that improvement came only with control of the underlying infection. Pratt (16) and Benward (17) mentioned the injury to the body from hypoxemia in bronchiolitis.

(14) Smith, D. T. and Martin, D. S.: *Ziessner Textbook of Bacteriology* 9th edition. Appleton-Century-Crofts Co. Inc. New York, 1948.

(15) Ebert, R. V.; and Stend, E. A. Jr.: Circulatory failure in acute infectious disease. *J. Clin. Investigation* 20: 671-679 Nov 1941.

(16) Pratt, E. L.: Symposium on pediatric methods of treatment: acute bronchiolitis in infants. *M. Clin. North America* 28: 1098-1107 Sept. 1944.

(17) Benward, J. H.: Acute bronchiolitis in children. *Journal Lancet* 68: 24-27 Jan. 1948.

and commented on the cardiac involvement. Although there have been no published reports describing electrocardiographic changes Rubin (18) found such changes clinically as well as at autopsy.

In observing our patients with bronchiolitis we noted that in those with severe hypoxemia, the pulse rate was faster and the heart tones more distant than in the milder cases. ECG's on these patients usually showed evidence of myocardial involvement. At autopsy no cellular infiltration of the myocardium was found; but in four cases there was edema and three showed degenerative changes in the nuclei of the muscle fibers.

The edema of the myocardium and the degenerative changes in the nuclei are probably explained on the basis of hypoxemia, toxemia and obstruction of the pulmonary blood flow. These factors probably account for the electrocardiographic changes as well.

ECG's with the three conventional leads in 45 of the sickest patients showed an abnormality in 37 percent. These changes however did not tend to follow a pattern. When similar studies were made on patients with other infections abnormal ECG's were found, for instance, they were found in 14 percent of the patients with poliomyelitis. The ECG may show such deviations from the normal as abnormal rhythm, disturbances in the Q-T and P-R intervals, deformity or change in potential of the QRS complex and the T-waves and significant displacement of the RT segment. Among the electrocardiographic changes which are not considered abnormal are changes in rate especially tachycardia, P-wave changes, changes in voltage, and axis deviations.

An important conclusion from the study was that the electrocardiographic abnormalities in all patients who survived were reversible.

TABLE 3.—*Distribution of abnormal electrocardiograph changes*

<i>Electrocardiographic change</i>	<i>Number of patients</i>
Abnormal rhythm .....	2
Frequent extrasystole .....	1
Paroxysmal tachycardia .....	1
Abnormal QRS segment .....	3
Abnormal T <sub>1</sub> .....	12
Abnormal T <sub>2</sub> .....	9
ST displacement .....	7

Abnormal P-R or R-T intervals were not observed in this series.

Serial ECG's of 17 patients (37 percent of those on whom ECG's were made) showed a grossly abnormal form (table 3).

Abnormality in the QRS complex in three tracings consisted in broadening, lurring or splintering of the RS segment. Abnormality in the T wave was the most common deviation, which is true too in most infections which alter the normal tracing. T<sub>1</sub> was more abnormal

(18) Rubin, M. L. Personal communication, Sept. 1949.

than T<sub>2</sub>. The changes encountered in the T wave were low amplitude (under 2 mm for lead I under 1 mm for lead II) inversion notching grossly bizarre deformity isoelectric T wave and a diphasic T wave. One peaked T wave was encountered. Displacement (over 2 mm) in the RT segment occurred in seven ECG's.

### TREATMENT

Bronchiolitis is a self limited disease and in most instances is unaffected by antibiotics. Treatment with aureomycin streptomycin penicillin, or sulfadiazine caused little difference in the length of hospital stay in our series except in isolated cases. As a general rule the patients respond poorly to chemotherapy. Because of the occasional dramatic relief of symptoms because of the presence of bacteremia in 8 percent of the patients and in view of the patients age and susceptibility to many types of organisms antibiotics are indicated with or without the aid of penicillin.

The more serious clinical signs observed are caused by the resulting from the poor oxygen exchange. As a rule recovery occurs when the oxygen exchange is improved and the oxygen need is satisfied. Treatment therefore should be aimed toward increasing the use of oxygen plus cold steam (aerosol water vapor) and humidification the most effective method for relieving the bronchial obstruction. The high humidity acts to decrease both the amount and thickness of bronchial secretion. In some patients the dyspnea may fail to respond to this treatment in which case it may be supplemented with helium to decrease the density of the gases and thus aid in passing through the partially plugged bronchioles with greater ease.

As restlessness is usually extreme small amounts of a sedative (4 cc of whisky to 8 cc of sugar water or up to 0.03 gram of chloral or pentothal) may be given, care being taken not to depress respiration. This also helps to relieve the apprehension and to decrease the oxygen need.

Overhydration and abdominal distention are seldom problems so that fluids and food can be offered as desired. Intravenous fluids should be used with caution as an overload of the pulmonary circulation may result. Small transfusions however frequently seem to be of benefit. Gamma globulin was given to a few patients but no dramatic results were noted.

Digitalis was given to a few patients showing electrocardiographic and clinical evidence of heart failure. It slowed the pulse and strengthened the heart beat. Stimulation with caffeine sodiobenzoate may be required. Some relief was occasionally obtained with the use of antihistaminics or aminophylline but usually there was little response to these drugs. General supportive measures with good nursing care are of prime importance.





*Figure 2.—Foreign body after removal from nose*

strated. No infection ensued and rapid healing took place so that there was no change in the appearance of the nose. A permanent perforation of the nasal septum remained. The foreign body consisted of two layers of glass containing a highly radiopaque mineral substance cemented to each side of a sheet of celluloid.

# An Illuminated Endotracheal Stylet

David E. MacQuigg Major M.C. U. S. A.

**A**N industrial extension flashlight has proved an illuminated endotracheal stylet. The handle is a standard penlite with an extension of 8-inches using a grain of wheat instrument bulb (fig 1) purchased with extensions of various length but for an extension of no longer than 12 inches is best. It is not routine in our endotracheal work, but when its the added feature of an illuminated stylet has been

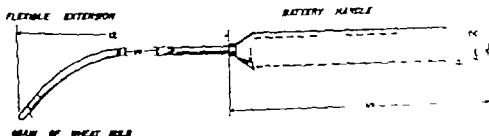


Figure 1 —Extension flashlight.

for examining the vocal cords while intubating and in patients in whom there is trauma of the pharynx with bleeding. It allows the operator to locate the tip of the endotracheal tube even if it is covered by blood. This feature is more noticeable when the translucent Portex tubing is used as the light shines easily through the tubing and illuminates the oral pharynx.

In performing an emergency intubation on two occasions the lamp of the laryngoscope failed just as intubation was being attempted but the illumination furnished by the stylet was adequate to complete the intubation with ease saving time and making another attempt at intubation unnecessary.



# Treatment of Frostbite

## Report of a Case

Jack Fishman *Lieutenant Commander MC, U. S. N. R.*

THE patient was a 44 year-old white woman who 27 years prior to her coming under my care had suffered frostbite of her legs. Following this she had multiple ulcerations of both legs which healed with local therapy. However the scars would break down so that some ulceration was almost always present. During cold weather the patient suffered extreme pain numbness and stiffness in her legs causing her to be totally incapacitated. It was necessary at such times for her to wear several layers of woolen cloth on her legs to afford added relief and protection. In addition she was able to go out doors for only very short periods of time.

Examination of the lower extremities revealed several discrete ulcers on the lower portions of both legs. Many pigmented scars were found indicating healed ulcers. The surface temperature of both legs was usually low. The dorsalis pedis and popliteal artery pulsations were of poor quality.

Priscoline (benzazoline hydrochloride) therapy was instituted. The patient was given 12 injections of 2 cc (50 mg.) each every 3 days into the femoral arteries and 25 mg. were given orally t. i. d. for 6 months. A favorable response to this form of treatment was immediate. The ulcers healed spontaneously within several weeks. The pain disappeared after the second injection and the legs were constantly warm and limber thereafter. The pigmented healed areas became lighter in appearance. The patient was able to discard her woolen coverings and go outdoors for longer periods in the winter months. The surface temperature of her lower extremities improved as did the quality of the dorsalis pedis and popliteal artery pulsations. Six months after discontinuing the treatment, the patient was still symptom-free and entirely well without any further medication.

## ARTICLES PUBLISHED BY PERSONNEL OF THE MEDICAL SERVICES OF THE ARMED FORCES

Kelly LeMoyné C., Commander MC (S), U. S. N. R., Effective Management of the Rheumatic Diseases with Special Consideration of the Role of Physical Agents in Treatment. *The American Practitioner and Digest of Treatment* 1 1300-1302, Dec. 1950.

Schermer Robert Capt. DC, A. U. S. Prosthetic Rehabilitation in Oral Cancer. *Dental Items of Interest*, Feb. 1951.

Van Eycken, Ernest J., Lt. Col., MC, U. S. A., and Cox L. G., Capt. MC, U. S. A. Traumatic Hematoma of the Larynx. *Annals of Otology Rhinology and Laryngology* 60-253, Mar 1951.

# Boards, Certificates, and Psychiatric Reports

Donald B. Peterson, Colonel, MC A U S (1)

**T**HIS article consists of a series of comments on implementation of regulations which are interrelated because they have as a common denominator the vagaries of human behavior. One or another of these vagaries affect all members of the Army. They create a major problem to the military medical officer. Although the following is written as an aid to the Army psychiatrist in the hospital and may be used in cookbook fashion in the hands of a specific person, careful perusal will reveal a philosophy from which attitudes and concepts may be derived which enable an Army medical officer to see and act in accordance with the philosophy behind the regulation. In extreme cases, medical officers have been known to take pleasure from the execution of a clearly planned bit of paper work. The subject matter is timely because of the expansion of the Armed Forces and the influx of young draftees into military and forensic training is only starting.

The psychiatrist is concerned primarily with the care of the patient. It is possible to accomplish this primary mission only if psychiatric procedure is carried out accurately and expeditiously. Because much administration is directly involved with boards, certificates, and reports dealing with the sanity, personality, or other mental, emotional, and behavioral attributes of patients, a thorough and practical understanding of such procedures is prerequisite to the successful practice of psychiatry in the Army.

The publications listed in table 1 are part of the working knowledge of the Army psychiatrist.

Boards, certificates, and reports are similar in that their function is to provide specified information to certain persons under certain circumstances. Just what information is to be provided and to whom it should be directed may be specified or these may be implicit in the circumstances. For example, an untried prisoner may be referred spe-

(1) Fitzsimons Army Hospital, Denver, Colo.

## LE 1—Publications frequently used

Code number	Title	Remarks
AR 420-5 20 May 1940 TM 8-240 Sept. 1950 AFM 160-42	Boards of Officers for Conducting Investigations Psychiatry in Military Law	General rules and procedures for boards investigating and making of evidence.
SR 600-500-5 29 Apr 1949 AFR 160-24	Manual for Courts-Martial, U. S. 1951 Personnel—Psychiatric Evaluation Prior to Referral to Boards	Chapter 24 par 120-124 Insanity
AR 600-450 7 Nov 1949 AFR 39-11	Personnel—Separation for Physical Disability	Medical boards and physical evaluation boards.
SR 600-440-1 7 June 1949	Personnel—Disposition of the Psychotic	Including general prisoners
SR 615-360-40 23 Aug. 1950 AF PMP-AR 3 & 211	Excluded Personnel—Disposition of Individuals with Physical or Mental Disability	Discussion of administrative limitation of enlisted personnel and authority for acceptance of resignation of enlisted personnel with existing prior to service (EPTS) physical disability
AR 615-366 26 Oct. 1949 AFR 39-21 and AFR 39-23	Excluded Personnel—Misconduct Fraudulent Entry Absent Without Leave Desertion Conviction by Civil Court	Par 9—physicality unfit deserters and deserters; par 21—fraud, concealment of physical defects
AR 600-443 12 Jan. 1950 AFR 35-66	Personnel—Separation of Homosexuals	
AR 615-368 27 Oct. 1948 AFR 39-17	Excluded Personnel—Discharge Unfitness	
AR 615-369 27 Oct 1948 AFR 39-16	Excluded Personnel—Discharge Insipidity or Unreasonableness	
AR 345-415 14 Aug. 1945	Military Records—Daily Sick Report	Investigation of line of duty
AR 605-200 26 J n. 1951 AFR 34-2	Officers—Demotion and Elimination	
AR 40-590 21 J n. 1946	Medical Services—Administration of Hospitals, General Provisions	Authorizes the commanding officer of hospital to appoint disposition board to drive him in such cases as he considers necessary

cifically for action under par 121 Manual for Courts Martial (MCM). Usually however he is just sent to the hospital for mental observation. This circumstance implies referral and authorizes taking action under par 121 MCM. It would be uneconomical to enter into correspondence with the unit commander merely to get a formal affirmation of what is already intrinsically authorized by the circumstances.

A report is an informal document without legal standing. It is useful to convey information in any case in which there is no possibility that evidence is required.

A certificate by an officer is similar to an affidavit in that an officer puts himself under oath by the act of signing a certificate. He makes himself responsible for the truth of the document. Any document becomes a certificate when an officer signs a statement containing the words "I certify." A certificate is usually admissible as evidence to a board such as convened under AR 615-368 but not a court martial. Often the brief clinical history of an AR 600-450 board is used in the event that the board and certificate may be used by other boards such as those convened under AR 615-368 for court martial investigations. Although under certain circumstances a certificate is useless as evidence because it is not based on facts, it is useful in relation to command action. For example, although a board cannot take cognizance of a certificate, the certificate is useful in determining whether the accused is to be tried or not.

Boards are authorized by various regulations and their functions are specific or general depending on the regulation. The purpose is to give command authority the benefit of the mature and informed judgment of experienced officers. The use of boards is an attempt to give command a complete and accurate report on which to base a decision. In most cases, great latitude is given in making findings and recommendations so that the board properly serves the board are well served.

*Mechanics and elements* — The formality of the document varies in the board, least in a report and within each type of document varies with the regulation, purpose, and ground rules of the command. In general, the following features and headings are standard (fig. 1): (1) heading which includes the title of the document, the authorizing regulation, and the date; (2) the diagnosis; (3) pertinent history; (4) expert interpretation of the diagnosis, presenting the salient features in nontechnical terms; (5) findings; (6) comment which is optional but useful in arriving at recommendations; (7) recommendations; and (8) signature with title because the title indicates the role of the psychiatrist concerning the particular case rather than his duty designation of ward officer.

Almost all board reports are submitted on WD AGO Form 8-118. This form is required for AR 600-450 boards and is convenient for other



**FITZSIMONS GENERAL HOSPITAL  
DENVER, COLORADO**

**CERTIFICATE**

I certify that this is the report of neuropsychiatric examination in the case of

Grade	Name	ASN	Organization
who was admitted to this hospital on _____		and that after careful examination the diagnosis is found to be:	

(Use same code number and nomenclature as given in Final Summary and on Form 35a)

Further History

Medical Status

This condition is characterized by

In my opinion, the soldier is not insane, possesses sufficient mental capacity to know the difference right and wrong, should be able to adhere to the right, and refrain from the wrong; and so be morally responsible for his acts.

This condition is not amenable to hospitalization, treatment, disciplinary action, reassignment or organization, or reclassification to another type of duty. This soldier has a defect which warrants CDD or other disposition through medical channels.

That this soldier be continued on duty until command decision is reached. He be retained in the Service. In the event that his performance is such that the Service, the soldier should be separated from the Military Service under the because of

boards With this exception no printed form is necessary The whole board proceedings may be typed on blank paper All copies of board proceedings are signed by all members except the AR 600-450 and AR 40-590 boards in which the original is signed and the first copy initialed by only the president and recorder *All copies including file copies of certificates must be signed* An unsigned document labeled certificate is not a certificate and is without value Further findings not covered by the form are made as necessary and any inapplicable findings printed on the form are labeled DNA (does not apply)

To fulfill their purposes these documents must be clear and logical and the reasoning involved must be intelligible to the layman. The diagnosis and its interpretation must be backed up by the history and the findings must support the recommendations Further these documents must be legible Because from 6 to 8 copies are often required if at all possible the original should be on onionskin paper Such paper can be mimeographed if a sheet of blank onionskin paper is inserted between each printed sheet to come off the roller People may resent this extra effort and may even claim it is impossible but the medical effort is wasted if the document is illegible In the preparation of copies of forms care must be taken that the forms are in register during typing All this is obvious but nonetheless often becomes a major problem The various regulations specify the elements that are essential to make findings and recommendations for positive action Unless these elements exist and are recorded in the document the whole effort is ineffective and wasted

#### ACTION REQUIRED PURSUANT TO SPECIFIC REGULATIONS

AR 600-450 —With certain exceptions military personnel are separated through medical channels when unfit for further duty by reason of physical or mental disability Disorders such as pathologic personality character and behavior disorders immaturity reactions and mental deficiency are considered to be personality variations rather than diseases If a patient has a psychosis (see SR 600-440-1) the board will make the following findings (1) diagnosis (2) whether or not he can be released from military control without danger to himself or others (3) whether or not he has the mental capacity to understand the nature of the board proceedings and to conduct or cooperate in them (4) that he has attained maximum benefit from military hospitalization, (5) whether he should be discharged into his own care the custody of his family or to another hospital (6) how many attendants if any will be required when he is transferred from the hospital and (7) such other pertinent findings as his ability to distinguish right from wrong and to adhere to the right are required when some offense is alleged

The AR 600-450 board i.e. the medical board is in general similar to the old AR 40-590 disposition board in that recommendations of referral to Physical Evaluation Boards to boards convened under AR 615 368 AR 615 369 or AR 605 200 may be made as well as

# WILKINS GENERAL HOSPITAL DENVER, COLORADO

## CERTIFICATE

I certify that this is the report of neuropsychiatric examination in the case of

Grade	Name	ASN	Organization
who was admitted to this hospital on		and that after careful examination the diagnosis is	
found to be:			

(Use same serial number and nomenclature as given in Final Summary and on Form 55a)

Permanent History

Mental Status

The condition is characterized by

In my opinion, the soldier is not insane, possesses sufficient mental capacity to know the difference between right and wrong; should be able to adhere to the right, and refrain from the wrong; and is considered to be morally responsible for his acts.

The condition is not amenable to hospitalization, treatment, disciplinary action, training, transfer to another station or organization, or reclassification to another type of duty. This soldier has no mental or physical disease or defect which warrants CDD or other disposition through medical channels.

Recommendation: That this soldier be continued on duty until command decision reached as to whether or not he should be retained in the Service. In the event that his performance is such that he is deemed to be useless to the Service, this soldier should be separated from the Military Service under the provisions of AR 615-36 because of

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recommendations of return to duty with or without limitations. Many patients reach a general hospital who perhaps would not if the referring hospital were more liberally staffed psychiatrically. The patient may have exaggerated some trifling complaint in an effort to avoid duty. The patient's physical condition often does not warrant a medical board but the circumstances may call for it. In case of doubt it is well to hold a formal medical board or an AR 40-590 disposition board, since such action becomes a matter of permanent record and carries more weight than the fact that the patient was hospitalized and the ward officer returned him to duty. The board report becomes a part of the Field 201 file and those who must deal with the patient on duty have a right to know the result of the medical deliberations. Conversely care must be exercised to see that the material in the brief clinical history is material and relevant and that personal material that is inconsequential to the issue be kept out of this record of patients returned to duty. Suitable accompanying papers or exhibits may be necessary e. g. if a recommendation is made for Veterans Administration or state hospitalization or discharge to relatives. IO-P IO authorization from the state or acceptance from the relative is necessary. A brief clinical history is always required.

SR 600-440-1 par 9 (Disposition of general prisoners).—The findings and recommendations required of boards convened under this regulation are explicitly stated therein and will not be repeated here. An SR 600-440-1 and AR 40-590 board must be accomplished at least 60 days prior to expiration of sentence. If this is impracticable the reason for delay must accompany the board.

SR 615 360-40 permits persons unfit for military service because of physical or mental disability which existed prior to service and was not aggravated by service to submit application for discharge for the convenience of the government and presents a discussion of administrative elimination of enlisted personnel. Similar procedure is authorized for Air Force patients per authority of AFR 39-14 and AF PMP-GH 3 & 211. A medical board held in such cases must make the following findings: (1) diagnosis; (2) that the condition existed prior to entrance on present period of active service; (3) that the condition was not incurred in line of duty during a prior period of active service; (4) that the condition has not been aggravated during prior or present service; and (5) that the soldier has submitted his request for discharge. If all these findings can be made a recommendation for discharge for convenience of the government is indicated, otherwise the recommendation should refer him to a Physical Evaluation Board. The application for discharge is submitted with the board proceedings.

Manual of Courts-Martial U. S. 1951 par 121 and 122c.—Psychiatric examination with a view to aiding in the determination of mental responsibility, psychologic factors, mitigating circumstances of offenders, and with a view toward making recommendations to command authority.

regarding disposition in accord with the best interests of both the soldier and the government is authorized by the MCM TM 8-240 and custom. MCM par 121 refers to pretrial psychiatric examination and par 114 to posttrial preapproval psychiatric examination.

Although MCM par 121 and 122c refer to a board of one or more medical officers and to the period between the preferring of charges and the approval of a sentence it is customary for commanders to refer offenders for mental examination before charges are preferred. In such cases ordinarily a certificate is executed rather than a board. Although an extremely brief certificate may fulfill the formal requirement it must be remembered that in each such case the psychiatrist becomes available to testify in person. Therefore it is best that the certificate be concise rather than brief and contain sufficient material to refresh his memory in the event he must testify in person. At a large army hospital even in routine pretrial clearances and especially where inpatients are concerned the tendency is to hold a formal board since this procedure seems more considered and thoughtful and more in keeping with the time and effort already expended on the patient.

Separate and distinct coverage must be given the three sanity findings

1 Was the accused at the time of the alleged offense so far free from mental defect disease or derangement as to be able to distinguish right from wrong concerning the particular acts charged?

2 Was the accused at the time of the alleged offense so far free from mental defect disease or derangement as to be able to adhere to the right concerning the particular acts charged? and

3 Does the accused possess sufficient mental capacity to understand the nature of the proceedings against him and to conduct or cooperate intelligently in his defense? It must be remembered that if the soldier is not under charges he is not the accused but is to be referred to as the individual or the soldier.

Recommendations from the psychiatric point of view suitable to the situation are made with consideration for the best interests of both the soldier and the service. Comment is often made as to whether or not a bar to trial by reason of insanity is believed to exist. The recommendation may be "none". Often there is little to be accomplished by trial and a recommendation for administrative separation is indicated.

AR 615 366 par 9 authorizes the administrative separation of physically unfit deserters and absentees. No board is required though such disposition may be recommended by a board. Deserters and absentees who are *permanently incapacitated* by medical or surgical conditions or by *mental deficiency or constitutional psychopathy* who obviously cannot be adapted to military service may be eliminated via this regulation. The document recommending this separation must find that (1) the medical or surgical condition is permanently incapacitating in

that it is not temporary or curable within a reasonable period of time or (2) the mental deficiency or constitutional psychopathy (use those words) renders the soldier loadable to the military service (3) the diagnosis as recorded constitutes a medical, surgical or mental deficiency or a constitutional psychopathy (thus emphasizing that within the meaning of the regulation, neurosis is medical, and passive dependency is a constitutional psychopathy) and (4) in cases in which there might be a question of sanity (be very liberal) the patient had the mental capacity to form the intent to desert. This is best accomplished by making the three sanity findings previously referred to.

AR 615-366 per 2b authorizes administrative separation for fraudulent entry into the Army. The regulation relates to the individual's procuring his enlistment or induction by concealment of a physical defect which would have made the individual ineligible for enlistment or induction. A true extract copy of NME Form 4 or SF Form 89 in cases of enlistment or induction respectively should be secured to show how the soldier answered the questions concerning his previous medical history. If a soldier who entered the service fraudulently possesses such qualifications that he is an asset to the service the commanding general of an army in the zone of the interior may waive the right to discharge him for fraud. If this is done further action or cognizance of the fraudulent entry cannot be taken during the current service. Implementation is accomplished by an AR 600-450 board which finds that the soldier has fraudulently entered the service but that he possesses such qualifications that he is an asset to the service and recommends that the right to discharge him for fraud be waived. Other pertinent recommendations such as return to duty are made.

AR 600-443 directs the prompt separation of known homosexuals in the Army as mandatory. The procedure and definitions of classes of homosexuality are specified in the regulation. AFR 35-66 is practically identical. The medical document is usually a certificate with the following finding: (1) diagnosis (2) class of homosexuality (with a statement that the soldier is a true confirmed or habitual homosexual or possesses only homosexual tendencies) (3) that the soldier did not claim uncontrollable perverse tendencies for the purpose of avoiding further military service (4) that the condition is not presently amenable to therapy and that further effort at rehabilitation will not make him of use to the military service (5) (6) and (7) the three sanity findings because the soldier may come to trial.

AR 615-368 and AR 615-369 authorize the administrative separation of enlisted personnel because of (1) unfitness (2) ineptitude or (3) unsuitability generally caused by pathologic personality (clerk attitude, lack of motivation, unwillingness or mental deficiency). SR 600-500-5 and AFR 160-24 state that hospitalization of such persons is usually unnecessary.

## Basic policies

1 Non-effectives who are not disabled are to be disposed of through non-medical channels

2 Continued effort will be made to screen and eliminate inapt and unsuitable persons. A soldier will be discharged by AR 615 369 only when it is determined that he cannot be *developed* to the extent where he may be expected to absorb further military training and/or become a satisfactory soldier

3 An individual who has demonstrated inaptness or unsuitability for military service but whose psychiatric or physical condition is not such as to warrant discharge for disability will be disposed of\* under AR 615 369

4 It is not necessary that a soldier be reduced in grade prior to his appearance before an AR 615-369 board

5 A person will be discharged from the service by AR 615 368 only when it is definitely established \*\* that he cannot be *rehabilitated* to the extent where he may be expected to become a satisfactory soldier

6 Persons discharged from the Army by AR 615 368 or AR 615 369 will be reentered only on authorization by the Adjutant General

It will be noted in each regulation that a medical officer will examine and report on the soldier's mental and physical condition. Where psychiatric considerations are involved the medical officer will be a psychiatrist and where *any doubt exists as to the existence of mental or physical disability the soldier will be examined by a board of medical officers*. This board may be convened under AR 40-590 and other authority as may be proper to the type of case and its findings reported on WD AGO Form 8-118

1 Whether or not psychiatric considerations are involved it is believed that if a psychiatrist examines the patient the report of the examination should be in certificate form and should contain those elements necessary for the psychiatrist's report

2 The board report although somewhat different in form from a certificate contains the same elements. A timesaving effective policy is to convene a board on a patient if a lay person might feel that doubt exists as to the existence of a mental or physical disability e.g. on a patient referred from another station for the express purpose of making this determination prior to AR 615-368 or AR 615-369 proceedings

It is necessary that the observations and findings outlined below be made to justify a conclusion that the soldier is (1) unfit or shows (2) inaptitude or (3) unsuitability for the service. These observations



and findings as well as recommendations are the necessary elements of both certificates and boards

1 AR 615-368—Unfitness In support of the finding of the soldier's unfitness it must be stated that he (a) shows certain habits or traits of character which must be named with their manifestations (b) possesses *nocturnal habits* (c) *is guilty of repeated petty offenses* (d) *is a habitual shirker* or (e) was recommended for discharge by a board of medical examiners as outlined in par 1a(1)(e) AR 615-368 because of psychopathic (antisocial) personality (2) or because the board classified him as having no disease and his record revealed frequent disciplinary actions and/or it is clearly evident that his complaints are unfounded and are made with the intent of avoiding service

Other necessary findings are that (a) he is *totally unfit* for further retention in the military service (b) his rehabilitation is considered impossible because either repeated attempts to accomplish this have failed or attempts at rehabilitation are impractical for reasons which must be stated (c) the soldier was and is mentally responsible both to distinguish right from wrong and to adhere to the right (3) (d) he cannot be rehabilitated to the extent where he may be expected to become a satisfactory soldier (3) and (e) there are no disqualifying mental or physical defects sufficient to warrant discharge through medical channels (3).

2 AR 615-369—Inaptitude A soldier will be discharged for inaptitude only when it is determined that he does not possess the required degree of adaptability necessary for military service after reasonable attempts have been made to reclassify and reexamine him in keeping with his abilities and qualifications In support of such a finding it must be stated that he (a) lacks the required degree of adaptability for military service (b) lacks general fitness (c) lacks readiness or skill

(d) is extremely unhandy or (e) is *inapt* in some other specific way Within the present meaning of the regulation, inaptitude is hardly a psychiatric determination but is rather a conclusion reached by the soldier's unit commander based on observation of his performance Inaptitude should come into psychiatric consideration only in the event that such conclusion has been reached and the medical officer is asked to determine whether or not there is a psychiatric basis for the already demonstrated inaptitude

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(2) This provision is particularly applicable to (1) soldiers who are patients on psychiatric service the expert determination can be made as to whether or not attempts at rehabilitation are impracticable and (2) those who though patients on psychiatric service can be made as other attempts e. g., environmental, are practicable within the hospital setting.

(3) In these words

3 AR 615-369—Unsuitability In support of this finding it must be stated that the soldier (a) lacks physical stamina (4) (b) presents such character and behavior disorders as a schizoid paranoid, cyclothymic inadequate or asocial personality or emotional instability dependency or aggressive immaturity reactions (c) has a mental deficiency (d) shows apathy defective attitudes and inability to expend effort (e) has acute reactions to special stress associated with one of the personality types mentioned in (b) (c) or (d) and (f) has an immaturity reaction with enuresis or other symptomatic habit formation

Other necessary findings are that (a) he is unsuitable for further military service (b) he cannot be developed to the extent where he may be expected to absorb military training and/or become a satisfactory soldier (c) the soldier was and is mentally responsible both to distinguish right from wrong and to adhere to the right (3) and (d) there are no disqualifying mental or physical defects sufficient to warrant discharge through medical channels (3)

In certain persons there is a combination of mental or physical disability and unfitness inaptitude or unsuitability Such combined cases are disposed of by first determining whether or not the soldier is unfit for military service by reason of physical or mental disability If he is so unsuited he is presented to the AR 600-450 board with a view to referral to the Physical Evaluation Board The AR 600-450 board makes a specific finding that although the unfitness inaptitude or unsuitability exists the presenting cause for inability to perform duty is the medical disability If there is no medical disability but the soldier is rendered noneffective by reason of unfitness inaptitude or unsuitability he will be referred to a board of officers convened under the proper regulation with a view to administrative discharge Persons who are unfit because of personality deviation poor motivation or unwillingness are separated for those causes notwithstanding the presence of a non disabling medical or surgical condition when maximum benefit from hospitalization for such a condition has been attained

AR 345-415 par 9 authorizes the appointment of an investigating officer in every case of injury off the post or when incurred under circumstances indicating willful misconduct willful neglect or gross negligence or when the surgeon requests investigation Battle casualties directly caused by enemy action are not investigated A certificate by the medical officer is required and must show (1) the extent of the injuries (2) an estimate of future possible partial or complete permanent disability (3) a statement as to the patient's sobriety on first examination (4) whether or not the patient was under influence of drugs and (5) the sanity findings with particular regard

(4) This applies to the group unfit to render effective service If returned to duty but who can be returned to civil life without recurrence of symptoms The purpose of the old era would be likely recur on return to duty but should not recur if they returned to their family

to the injury or suicidal attempt in all cases of attempted suicide and in all other cases where mental competency is in question.

AR 605-200 provides for the elimination and demotion of officers. This regulation for officers is comparable to AR 615-368 and AR 615-369 for enlisted personnel. Depending on degree demotion, elimination, or separation is indicated when an officer shows decrease in efficiency prolonged mediocrity lack of leadership lack of technical proficiency or failure to discharge his assignments. Elimination is indicated when an officer is personally financially delinquent misrepresents facts in an official document shows habitual intemperance recurring misconduct or apathy defective attitudes inability or unwillingness to expend effort or other character and behavior disorders. A recommendation that an officer be referred to a board of officers convened under AR 605-200 may be made by a medical board or by certificate. The concepts set forth in discussing persons with combination of mental or physical disability and unfitness ineptitude or unsuitability are applicable. Although the procedure is not covered in any regulation officers who are noneffective to a mild degree because of unfitness inadaptability or unsuitability may present a request to a medical board for unqualified resignation of commission. The medical board may make a finding indicating cognizance of this request, and may further find that its acceptance would be to the best interests of the government and may recommend its acceptance. AR 605-275 permits officer to submit his resignation at any time and also permits wide discretion by the Army in acceptance of such resignation.

# About The Army Medical Service

AN OPEN MEMORANDUM FOR MAJOR GENERAL BLISS

Paul I. Robinson, *Brigadier General, MC U S A.* (1)

IN JULY of 1947 you circulated to your staff several scripts which you had written and entitled *Thoughts on the Overall Aims of the Current Medical Administration*. It was your expressed thought that these ideas could be used as objectives. You desired us to make frequent reference to them as time progressed and developments occurred. Your three main themes were (1) quality performance (2) coordination and (3) total medicine. Many of the objectives had to do with personnel activities. The purpose of this memorandum is to record the accomplishments pertaining to these objectives.

## PROCUREMENT OF PERSONNEL

With regard to procurement of personnel you warned "Don't lower criteria for admission to Regular Army in spite of present shortage."

\* It has been recognized for several years that the key post war problem of the Medical Department would be the securing of an adequate number of competent doctors. Detailed planning should be started on how the gap could best be closed between requirements and available abilities.

Some mistakes have undoubtedly been made but of 1 908 applicants for the Regular Medical Corps since 1 July 1947 436 have been rejected for one reason or another. Complete information has been sought on each application and each case has been presented in detail to the Central Medical Department Board for adjudication. Of 401 applicants for the grades of Major and above 92 were rejected. A like proportion of junior applicants (344 out of 1 507) were not accepted. We had vacancies in all grades and it was therefore possible to adjudge every case on its merits. The fact remains that we did procure for the Regular Army Medical Corps 1 472 officers in the past 4 years and the net gain subtracting losses from retirement resignation transfer and

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(1) Chief Personnel Division Office of the Surgeon General, Department of the Army

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(1) Chief Personnel Division, Office of the Surgeon General, Department of the Army

death has been 918. The number of physicians commissioned in the Regular Army in these 4 years is equal to that of any previous period of 30 years.

In the fall of 1947 it became clear that one idea pervaded the thoughts of every young medical graduate—his desire to pursue residency training in a specialty. The Training Division had been laboring for months to establish acceptable residency training programs in certain of our hospitals. Approvals and partial approvals were beginning to be received but the training positions were occupied and rightfully so by our officers who were in the Corps before World War II and who had been diverted from clinical medicine for 4 or more years. Our clinical work at that time was largely being accomplished by Army Student Training Program (ASTP) participants who had graduated prior to June 1946 and who by law were required to serve for 2 years. The last group of these was on duty and with their separation from the service within the succeeding 18 months there was no source of replacements in sight. In those gloomy days the Personnel Division spent many hours attempting to correlate residency and internship training with procurement. The time-honored Army Internships had again been started but the number of interns obtained in the first 2 years was too small to be used as a procurement device to meet the problem ahead. It was known that a first lieutenant's pay for Internship was attractive to many young graduates because the majority of civilian institutions paid their interns little or nothing. This same factor applied to residencies but the Army did not yet have sufficient approved residencies. The idea was finally evolved to combine commissions in the Regular Army with residencies and internships in civil life. The exploration and development of this idea is alone a subject for an entire report but suffice it here to say that the following program was adopted and approved by Army authorities.

#### *Nine-point Procurement Program*

1. Commissioning 200 to 300 doctors per year in 1948 and 1949 who are in residency programs in civilian hospitals allowing them to remain in their civilian residencies even allowing them to compete for another year of formal training in civilian hospitals but on active duty status.

2. Commissioning 200 to 300 interns per year in 1948 and 1949 in civilian hospitals in Medical Corps Reserve allowing them to finish Internship on active duty status and compete for and accept residencies in civilian hospitals or Army hospitals provided they come into the Regular Army.

3. Obtaining 130 residencies in civilian hospitals in United States and having them reserved for Army use.

4. Procuring 400 to 500 officers per year in 1948 civilian ASTP and Army Intern source allowing them the 130 Army and 130 civilian residencies.

5 Requiring every doctor to agree to serve as a duty officer in the United States Army one year for each year of formal postgraduate training whether in a civilian or Army institution

6 Endeavoring to procure 100 to 300 mature well trained doctors directly into the higher grades (major lieutenant colonel and colonel)

7 Expanding the Army postgraduate teaching program as rapidly as possible both in the United States and overseas so the Medical Department will not have to depend on civilian institutions for anything except exceptional training

8 Improving medical service in the Army so everyone will like it This involves quarters human understanding social events excellent medical care and all of the things which were part of pre-war Army service and which were inherently so attractive

9 Advertising continuously for doctors to do one or two years of duty for specific jobs We are now advertising 143 positions in the European Theater and are publicizing specific jobs in the United States Most such assignments would be as Reserve Officers on active duty

It is interesting to note the success which was obtained in pursuance of each of the 9 points of the program. In 1948 194 and in 1949 139 civilian residents were commissioned. In 1948 233 and in 1949 296 civilian interns were placed in the program. Except for the residencies obtained for Professors of Military Science and Tactics and for such specialties as children's orthopedics neurosurgery and plastic surgery the third point of the program never materialized. The positions obtained did account for 60 to 70 positions each year and cannot be considered a total loss. Furthermore point 4 of the program broke down to some extent but was compensated for by the rapid approval of Army residency programs (point 7) so that 248 residents were accepted in 1948 252 in 1949 and 202 in 1950. Point 5 of the program was accepted and later became a Defense Department policy. Under point 6 of the program 309 officers in field grades were commissioned completely fulfilling the objective. Certain directives giving quarters and concurrent travel priorities for medical officers were effective until after the advent of hostilities in Korea. Point 9 of the program was not greatly successful in that only 15 or 20 physicians could be interested in long-term service.

Contributing to the number of duty personnel was the Defense Secretary's Moral Suasion program of 1949 which netted about 190 physicians. The advent of the conflict in Korea in the summer of 1950 brought definite realization to all in the Department of Defense and in the profession at large that a great expansion of forces could not be met by any measures short of Selective Service procedures. The 81st Congress passed Public Law 779 and under its stimulus requirements for physicians dentists and veterinarians have so far been met voluntarily.



death has been 918. The number of physicians commissioned in the Regular Army in these 4 years is equal to that of any previous period of 30 years.

In the fall of 1947 it became clear that one idea pervaded the thoughts of every young medical graduate—his desire to pursue residency training in a specialty. The Training Division had been laboring for months to establish acceptable residency training programs in certain of our hospitals. Approvals and partial approvals were beginning to be received but the training positions were occupied and rightfully so, by our officers who were in the Corps before World War II and who had been diverted from clinical medicine for 4 or more years. Our clinical work at that time was largely being accomplished by Army Student Training Program (ASTP) participants who had graduated prior to June 1946 and who by law were required to serve for 2 years. The last group of these was on duty and with their separation from the service within the succeeding 18 months there was no source of replacements in sight. In those gloomy days the Personnel Division spent many hours attempting to correlate residency and internship training with procurement. The time-honored Army Internships had again been started but the number of interns obtained in the first 2 years was too small to be used as a procurement device to meet the problem ahead. It was known that a first lieutenant's pay for internship was attractive to many young graduates because the majority of civilian institutions paid their interns little or nothing. This same factor applied to residencies but the Army did not yet have sufficient approved residencies. The idea was finally evolved to combine commissions in the Regular Army with residencies and internships in civil life. The exploration and development of this idea is alone a subject for an entire report but suffice it here to say that the following program was adopted and by Army authorities:

#### *Nine-point Procurement Program*

1. Commissioning 200 to 300 doctors per year in 1948 and 1949 who are in residency programs in civilian hospitals allowing them to remain in their civilian residencies even allowing them to compete for another year of formal training in civilian hospitals but on active duty status.

2. Commissioning 200 to 300 Interns per year in 1948 and 1949 in civilian hospitals in Medical Corps Reserve allowing them to finish internship on active duty status and compete for and accept residencies in civilian hospitals or Army hospitals provided they come into the Regular Army.

3. Obtaining 130 residencies in civilian hospitals throughout the United States and having them reserved for Army use.

4. Procuring 400 to 500 officers per year in 1948 and 1949 from civilian, ASTP and Army intern sources allowing them to compete for the 130 Army and 130 civilian residencies.

5 Requiring every doctor to agree to serve as a duty officer in the United States Army one year for each year of formal postgraduate training whether in a civilian or Army institution

6. Endeavoring to procure 100 to 300 mature well-trained doctors directly into the higher grades (major lieutenant colonel and colonel)

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## TRAINING

With respect to training officers of the Medical Corps you said that (1) in the last war we made a serious error in trying to turn all Regulars into administrative officers (2) The Army Medical Department could not perform its peacetime mission effectively nor prepare for war effectively without sending many officers to civilian institutions for postgraduate studies (3) officers should be carefully selected for Army residencies and civilian training on a competitive basis (4) all of our administrative medical officers would have to keep up professionally and many of them particularly those who were heading for appointments as Army Surgeons and allied positions should be particularly trained in preventive medicine and psychiatry (5) hospital executives and perhaps other administrative medical officers should have the advantage of civilian training and (6) the entire atomic warfare problem must be studied.

To avoid the errors you so succinctly pointed out it was necessary to establish a planned career for the professional group, the command and staff group and the preventive medicine group in the Medical Corps. Lodgers showing the progress of officers in these groups were necessary in order that intelligent assignment and control could be maintained. In addition each officer was entitled to know just where he stood in the program. A comprehensive career planning system was devised and placed into operation (2).

Career planning to be effective must extend to assignment in the most remote locations. This has been and is being accomplished by directive by personal and official correspondence and by listing of military and medical proficiency which is identified by MOS numbers in published orders when a change of station becomes necessary.

of the efficiency of the system is difficult. Besides which are frequently made by members of the Personnel

division and others two major efforts of adjudication have been attempted. In 1948 the Inspector General was asked to make a world wide survey to determine malassignments of medical officers. The report of this investigation was most encouraging in that few bad assignments were located. In an opinion sheet which has been applied experimentally to those Medical Corps and Medical Service Corps officers who have returned to the United States from the Far East in early 1951 very few officers have considered themselves other than fully utilized in the fields of their major through this opinion sheet should afford valuable other advances in the utilization field although no question that the system in part is effective being ordered to active duty will be classified and operations of the career management system.

(2) Fielding F. J. About the Army Medical Corps and Medical Service Corps. U. S. Armed Forces Medical Journal 11(1):194-195 Sept 1950.

Officers have continuously been made available for courses in civilian institutions in the fields of public health personnel atomic physics and hospital administration. Since July 1947 72 medical officers have completed full courses in these subjects. Thirty more have completed courses in the higher service schools (Command and General Staff College Army War College Armed Forces Staff College Industrial College of the Armed Forces and National War College). Beginning in the fall of 1950 students were selected for the basic and advanced courses in the Medical Field Service School but this project had to be abandoned because of the Korean conflict. Selections have again been made for the fall of 1951. In the past 4 years 953 medical officers attended the 1-week course in the medical aspects of atomic warfare. About 50 medical officers were sent to the Army's Basic Science Course at the Army Medical Center and 20 are soon to complete the military medical phase of the basic medical course. Hundreds of young physicians each month are completing a special 1-month indoctrination course at the Medical Field Service School. Officers are being made available to participate in numerous short professional courses both in and out of the Army.

Making officers available for training has been an important personnel function during these years and a reasonable success is reported. The only critical area is that of the basic and advanced courses in the Medical Field Service School and this although deterred by the Korean conflict appears now to be well under way. Selection of residents for the professional programs is still being accomplished in the orthodox manner using the judgment of representatives of the Personnel Training and Consultants Divisions of the Surgeon General's Office as well as representatives of the teaching hospitals. A special research project on this subject was initiated 1 July 1949 by the Personnel Division, and the third semiannual report on the project indicates that scientific methods of selection of residents may be more than a possibility. This work uses in part the vocational interest approach and will be pursued further. This project is being undertaken at Stanford University under Army contract.

### CONSULTANTS

In discussing civilian consultants you stated: "The formal development of a system of consultants is long overdue. We must establish as soon as possible a part-time civilian consultant system which will be charged with regular visits to and assessments of the professional work performed in our Army installations."

The civilian consultant system was developed to cover not only the specialized treatment and teaching centers but also the Army Area Medical Service and overseas commands. Too much cannot be said in praise of the interest of the Society of Medical Consultants of World War I in the establishment and operational assistance in this program. There are 1380 names on the list of consultants to the Surgeon Gen-

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(2) Fielding, F. J. About the Army Medical Service: Medical Corps officer classification. U. S. Armed Forces M. J. 1: 1081-1083 Sept. 1950.

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eral. In fiscal year 1951 9,303 man-days of service will have been rendered to teaching hospitals 1,906 to overseas commands and 6,639 to other medical installations in the United States a total of 17,848. This program would have been past its peak, had it not been for Army expansion, because of the fact that qualified officers from the various training programs are rapidly being made available at Army stations everywhere and the need for consultant service has been proportionately reduced. The number of board-certified specialists in the Medical Corps has reached 232.

### COORDINATION

Your statement: Our entire Regular Army Medical Corps must be indoctrinated to a more liberal and far sighted policy on all issues affecting coordination sums up the coordination objective of our general aims. Coordination on matters of personnel have been extended widely to all federal services: the Department of the Army General Staff, the Office of the Secretary of Defense, the Navy Air Force Selective Service System, and the National Security Resources Board. Coordination on personnel matters has extended to the American Medical Association, the Association of American Medical Colleges, and state county and city medical societies. Local committees and societies of physicians who are veterans also have great interest in current personnel affairs of the Army Medical Service. Army Reserve groups throughout the nation are being considered in our coordination efforts. It is doubted that coordination of personnel matters has ever been so widely conducted. This same statement can be made of the Dental, Veterinary Nurse and other professional Corps of the Army Medical Service with their representative associations and societies.

### SUMMARY

This report is submitted in the sincere belief that (1) procurement of personnel for the Regular Army Medical Service during your administration can be said to be better than could have been foreseen, (2) the career planning system which has been developed has proved its value in selection for training utilization, and performance; (3) in spite of shortages the officers in the various Corps probably have reached peak in professional proficiency never before equaled in the history of the Army Medical Service; (4) military medical training must continue to be emphasized so that younger officers may replace the older in the command and staff career fields; and (5) coordination of medical personnel matters has reached into almost every medical community.

The Army Medical Service is thus well on its way to greater success in its goal of total medicine. With this knowledge those in the various Corps of the Army Medical Service are looking forward to their careers with confidence. There would appear to be no better way to end this report than in your own words:

The efficiency of the Army is directly a result of the thinking of the people in it.

## BOOKS RECEIVED

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- Blood Groups in Man** by *R. R. Race* Ph. D (Cantab.) M. R. C. S. (England) Director Medical Research Council Blood Group Research Unit, Lister Institute London and *Ruth Sanger* Ph. D (London) B. Sc. (Sydney) Medical Research Council Blood Group Research Unit, Lister Institute London, with a foreword by *Professor R. A. Fisher* F. R. S. 290 pages illustrated. Charles C Thomas Publisher Springfield Ill. 1950 Price \$6.50
- The Diagnosis and Treatment of Adrenal Insufficiency** by *George W. Thorn*, M. D. M. A. (Hon.) LL. D. (Hon.) Hershey Professor of the Theory and Practice of Physic Harvard Medical School and Physician-in-Chief, Peter Bent Brigham Hospital Boston Mass. with the collaboration of *Peter H. Forsham*, M. D. M. A. (Cantab.), Instructor in Medicine Harvard Medical School and Junior Associate in Medicine Peter Bent Brigham Hospital Boston Mass. and *Kendall Emerson*, J. M. D. Assistant Professor Harvard Medical School and Senior Associate in Medicine Peter Bent Brigham Hospital Boston Mass. Publication Number 29 American Lecture Series: A Monograph in American Lectures in Endocrinology 2d edition. 182 pages; illustrated Charles C Thomas Publisher Springfield Ill. 1951 Price \$5.50
- Social Aspects of Illness** by *Carol H. Cooley* Director of Social Service The Presbyterian Hospital Chicago with a foreword by *Edna S. Newman*, M. A. R. N. 305 pages W. B. Saunders Co. Philadelphia Pa. publishers 1951 Price \$3.25
- Medical Neuropathology** by *I. Mark Scheinker* M. D. Assistant Professor of Neuropathology and Assistant Professor of Neurology University of Cincinnati College of Medicine Attending Neurologist, Cincinnati General Hospital Cincinnati Ohio Consultant Neurologist Veterans Administration Hospital Fort Thomas Ky., Consultant Neuropathologist, U. S. Public Health Service Lexington Ky.; with a foreword by *Marion A. Blankenhorn*, M. D. Professor of Medicine University of Cincinnati College of Medicine Director of the Medical Department of the Cincinnati General Hospital Cincinnati Ohio 372 pages illustrated. Charles C Thomas Publisher Springfield Ill. 1951 Price \$10
- The 1950 Year Book of Dermatology and Syphilology** (December 1949 - November 1950) edited by *Marion B. Sulzberger* M. D. Professor and Chairman Department of Dermatology and Syphilology New York University Post-Graduate Medical School, Director of Dermatology and Syphilology Skin and Cancer Unit and University Hospital New York University-Bellevue Medical Center and *Rudolf L. Baer* M. D. Associate Professor of Clinical Dermatology and Syphilology New York University Post-Graduate Medical School Associate Director, Skin and Cancer Unit, and Attending Dermatologist, New York University Hospital 497 pages illustrated. The Year Book Publishers Chicago, Ill. publishers 1951 Price \$5



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**Perspective in Human Malnutrition: A Contribution to the Biology of Disease from Clinical and Pathological Study of Chronic Malnutrition and Pellagra in the African** by Joseph Gillman, D. Sc., M. B., B. Ch., and Theodore Gillman, M. Sc., M. B., B. Ch., Department of Physiology and Anatomy, Medical School, University of the Witwatersrand, Johannesburg Nutrition Unit of the Council of Scientific and Industrial Research and the University of the Witwatersrand, Johannesburg, South Africa. 384 pages; illustrated. Grune & Stratton, New York, N. Y., publishers, 1951. Price \$18.

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**The Neurosurgical Treatment of Traumatic Paraplegia**, by J. Lawrence Pool, M. D., Professor of Neurological Surgery College of Physicians and Surgeons Columbia University New York N Y Publication Number 83 American Lecture Series A Monograph in American Lectures in Surgery 107 pages illustrated. Charles C Thomas Publisher Springfield Ill., 1951 Price \$3

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**Medicine of the Year Internal Medicine** by Hugh J. Morgan, M. D. Professor of Medicine Vanderbilt University Psychiatry by Franklin G. Chung, M. D. Professor of Psychiatry University of Colorado Obstetrics and Gynecology by Frank Whitacre, M. D. Professor of Obstetrics and Gynecology University of Tennessee Pediatrics by Mitchell L. Rubin, M. D. Professor of Pediatrics University of Buffalo General Surgery by Warren H. Cole, M. D. Professor of Surgery University of Illinois Editorial Direction by John B. Youmans, M. D. Dean School of Medicine Vanderbilt University 3d issue 298 pages J. B. Lippincott Co. Philadelphia, Pa. publishers 1951 Price \$5

**Administrative Medicine** by Haven Emerson, A. M., M. D. Editor Professor Emeritus of Public Health, DeLamar Institute of Public Health, College of Physicians and Surgeons Columbia University 1 007 pages; illustrated Thomas Nelson and Sons New York N Y publishers 1951 Price \$10

**Medical Dictionary In Three Parts: English-French-German French-German English and German-English-French** With the contribution of J. Veillon, M. D. (Chief Editor) R. Bing, M. D. Professor of Neurology; S. S. B. Gilder, B. Sc. M. B. B. S.; T. Gordonoff, M. D. Professor of Pharmacology and Therapeutics; J. Karcher, M. D. Hon. Doc. of Internal Medicine; P. Knapp, M. D. Professor of Ophthalmology; H. H. Achy, M. D. Ophthalmology; P. Koenig, M. D. Gynecology and Obstetrics; H. Ludwig, M. D. Professor of Anatomy; W. Lutz, M. D. Professor of Dermatology; J. Minder, M. D. Professor of Urology; A. v. Muralt, M. D. Professor of Physiology; J. L. Nicod, M. D. Professor of Pathology; V. Panchet, M. D. Oto-rhino-laryngology; J. Roulet, M. D. Professor of Pathology Anatomy and Bacteriology; J. M. Samuels, M. D. Pathology; H. Schultheiss, M. D. Professor of Gynecology and Obstetrics; Cl. Secrétan, Ph. D.; G. Töndury, M. D. Professor of Hygiene and Anatomy; Cl. Vuilleumier, M. D. Surgery; A. M. Walther, M. D. Professor of Physiotherapy and Balneology; H. de Watterville, M. D. Professor of Gynecology and Obstetrics; H. Witz, M. D. Physiology and Physical Chemistry; H. Zickendraht, Professor of Physical Medicine; H. A. Zimmer, M. D. Radiology Technical and Bibliographic Contributions; J. Lavy 1 417 pages Grune & Stratton Inc. New York N Y, publishers 1950 Price \$18 75

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A History of Nursing, by Gladys Sellem, Ph. D., R. N., Chairman of Department of Sociology and Social Work Rosary College River Forest, Ill., formerly Director Department of Nursing, The College of St. Catherine St. Paul, Minnesota formerly Visiting Professor of Nursing Education, The University of Maryland Baltimore Md. and C. J. New Ph. D., Assistant Professor of Sociology The Catholic University of America Washington D. C. 2d edition. 439 pages; illustrated. The C. V. Mosby Co. St. Louis Mo. publisher 1951 Price \$3.75.

- Perception—An Approach to Personality** by *Robert R. Blake* Associate Professor of Psychology The University of Texas, and *Glen V. Ramsey* Professor of Psychology, The University of Texas in collaboration with *Frank A. Beach* *Urie Bronfenbrenner* *Jerome S. Bruner* *Norman Cameron* *Wayne Dennis* *Elise Frenkel Dumas* *Carl Rogers* *Ernest R. Hilgard* *George S. Klein* *Alfred Korzybski* *James G. Miller* *Louis J. Moren* *Clifford T. Morgan*. 442 pages illustrated. The Ronald Press Co. New York N Y publishers 1951 Price \$6
- Somatic Development of Adolescent Boys** A Study of the Growth of Boys During the Second Decade of Life by *Herbert Russell Stolz* M. D. and *Lois Mueh Stolz*, Ph. D. 557 pages illustrated. The Macmillan Co., New York, N Y publishers 1951 Price \$9
- Practical Microscopy** by *L. C. Martin*, D. Sc. A. R. C. S. D. I. C. Professor in the Technical Optics Department of the Imperial College of Science and Technology and *B. K. Johnson*, D. I. C. Lecturer in the Technical Optics Department of the Imperial College of Science and Technology 2d edition 124 pages illustrated Chemical Publishing Co. Inc. Brooklyn, N Y publishers 1951 Price \$2.50.
- A Primer for Psychotherapists** by *Kenneth Mark Colby* M. D. Adjunct in Psychiatry Mount Zion Hospital San Francisco Clinical Associate San Francisco Institute of Psychoanalysis formerly Lecturer in Psychiatry Department of Social Welfare University of California 167 pages The Ronald Press Co. New York N Y publishers 1951 Price \$3
- Radiographic Atlas of Skeletal Development of the Hand and Wrist**, Based on the Brush Foundation Study of Human Growth and Development Initiated by *T. Wingate Todd*, M. B. Ch. B. F. R. C. Late Henry Wilson P. yne Professor of Anatomy in Western Reserve University School of Medicine *William Walter Grunlich*, M. A. Ph. D., Professor of Anatomy Stanford University School of Medicine; formerly Professor of Physical Anthropology and Anatomy and Director of the Brush Foundation Western Reserve University School of Medicine *S. Idell Pyl* M. S. Research Associate Brush Foundation and Department of Anatomy Western Reserve University School of Medicine 190 pages illustrated. Stanford University Press Stanford Calif publishers, 1950. Price \$10
- Annual Review of Medicine** Volume I, by *Wladimir C. Castling*, Editor Stanford University School of Medicine and *Henry W. Newman*, Associate Editor Stanford University School of Medicine 484 pages Annual Reviews Inc. Stanford Calif publishers 1950 Price \$6.
- Personnel Administration in Public Health Nursing**, by *William Brody* Director of Personnel New York City Department of Health Lecturer in Public Health Administration Johns Hopkins University formerly Director of Personnel, National War Labor Board 209 pages illustrated The C. V. Mosby Co., St. Louis Mo. publishers 1951 Price \$3.25
- Handbook of Medical Management**, by *Milton Chabon*, A. B. M. D. Instructor in Medicine University of California Medical School, San Francisco *Sheldon Margen*, A. B. M. D. Clinical Instructor in Medicine University of California Medical School San Francisco *Henry D. Brauer*, A. B. M. D. Assistant Clinical Professor of Medicine and Pediatrics University of California Medical School San Francisco Assistant Clinical Professor of Pediatrics Stanford University School of Medicine Physician in Charge Isolation Division, San Francisco Hospital 2d edition. 508 pages illustrated University Medical Publishers Palo Alto Calif., publishers 1951 Price \$6.50.

**Correlative Neuroanatomy** by *Jeph J. McDonald*, M. S., M. Sc. D. M. D., *Joseph G. Chasid*, A. B., M. D. *Jack Lange*, M. S., M. D. 5th edition. 180 pages 70 illustrations. University Medical Publishers Palo Alto, Calif., publishers 1950 Price \$3

**Fever Therapy** by *H. Worley Kendall*, M. D., F. A. C. P. Professor of Physical Medicine and Rehabilitation University of Illinois Research and Educational Hospitals, Chicago, Ill. Publication Number 80; American Lecture Series A Monograph in American Lecture in Physical Medicine 101 pages illustrated. Charles C Thomas Publisher Springfield, Ill. 1951 Price \$2.

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**Growth and Development of Children**, by *Ernest H. W. Lyon*, M. D., Associate Professor and *Georg H. Lowrey*, M. D., Instructor Department of Pediatrics and Communicable Diseases University of Michigan Medical School. 260 pages illustrated. The Year Book Publishers Inc. Chicago Ill., publishers 1951 Price \$5.75

**The Kidney Medical and Surgical Disease** by *Arthur C. Allen*, M. D., Pathologist, The James Ewing Hospital, Assistant Attending Pathologist, Memorial Cancer Center New York City Attending Consultant in Pathology Veterans Administration Hospital, Bronx N. Y. 583 pages; 1,115 illustrations. Grune & Stratton New York, N. Y., publishers, 1951 Price \$15

**The Kidney Structure and Function in Health and Disease** by *Harner W. Smith*, A. B., Sc. D., M. S., Professor of Physiology New York University College of Medicine 1 049 pages illustrated. Oxford University Press New York, N. Y., publishers 1951 Price \$12.50.

**Tuberculosis Among Children and Adults** by *J. Arthur Myers*, M. D., Ph. D., Physician in Charge Chest Clinic Students Health Service University of Minnesota Chief of Tuberculosis Service Minneapolis General Hospital; Professor of Medicine Preventive Medicine and Public Health, Medical and Graduate Schools University of Minnesota Minneapolis, Minn., with an introduction by *Allen K. Kross*, M. D., Lecturer in Medicine Johns Hopkins University Past Editor American Review of Tuberculosis Baltimore Md. with chapters by *O. Theron Chagett*, M. D., F. A. C. S., *William S. Conklin*, M. D., F. C. C. P., *Jerome R. Head*, M. D., F. A. C. S., *Ralph C. Katson*, M. D., F. A. C. P., F. A. C. S., F. C. C. P., *John D. Steel*, M. D., F. A. C. S.; and *C. A. Stewart*, M. D., Ph. D. 3d edition. 894 pages illustrated. Charles C Thomas Publisher Springfield, Ill., 1951 Price \$12.50

**Large Quantity Recipes**, by *Margaret E. Terrell*, M. A., Professor of Home Economics and Director of University Dining Halls, University of Washington Seattle. **Cartoons** by *Jean McConnell*. Selected and Treated Under the Sponsorship of The American Dietetic Association. 414 pages; illustrated. J. B. Lippincott Co., Philadelphia Pa. publisher 1951 Price \$7

**The Contribution of Surgery to Preventive Medicine** by *Si Jervis Lathom*, K. C. V. O. C. B. E., Ch. M. F. R. C. S. E., Regius Professor of Clinical Surgery and Professor of Surgery University of Edinburgh. 55 pages. Oxford University Press New York, N. Y., publishers 1951 Price \$2.50.

- The 1950 Year Book of Pathology and Clinical Pathology (January-December 1950)** Pathology edited by *Heward T. Karsner* M. D. LL. D. Medical Research Advisor to the Surgeon General United States Navy Clinical Pathology edited by *Arthur Hawley Sanford*, M. D. Professor of Clinical Pathology University of Minnesota (The Mayo Foundation) Emeritus Consultant Division of Clinical Laboratories Mayo Clinic 454 pages illustrated. The Year Book Publishers Inc. Chicago Ill. publisher 1951 Price \$5
- Maternal Care and Mental Health** by *John Bowlby* M. A. M. D., Consultant in Mental Health, World Health Organization Director Child Guidance Department Tavistock Clinic London A report prepared on behalf of the World Health Organization as a contribution to the United Nations programme for the welfare of homeless children 180 pages 21 tables World Health Organization Palais des Nations Geneva Switzerland, publisher 1951 Price \$2
- Leprosy** by *E. Grunberg* (Conference Chairman) *L. F. Badger* *C. M. Carpenter* *J. A. Donll*, *D. C. Elliott*, *P. T. Erickson*, *W. H. Feldman*, *G. L. Fit* *E. D. Goldsmith*, *J. H. Grindlay* *J. H. Hawks* *R. L. Kahn*, *A. G. Karlson*, *E. R. Kellersberger* *F. C. Kluth* *J. T. Plint* *F. Reiss* *R. J. Schnitzer* *M. H. Soule* and *A. Zea*. Editor *Roy Waldo Miner* Associate Editor *B. J. Heneghan*. Annals of the New York Academy of Sciences, Volume 54, Art. 1 Pages 1-142 142 pages, illustrated New York Academy of Sciences New York, N. Y. publisher 1951 Price \$2.75
- A Review of Medicine by Members of the Faculty Northwestern University Medical School** Edited by *Benjamin Borbes* M. D. M. S. Ph. D. Associate Professor of Nervous and Mental Diseases Northwestern University Medical School Attending Neuropsychiatrist Passavant Memorial and St. Luke's Hospitals Chicago Ill. and Senior Consultant in Neurology Veterans Administration Hospital Hines Ill. 6th edition revised, appended, and reset. 814 pages Northwestern University Medical School Evanston Ill. publisher 1951 Printed by The Chief Printing Co. Chicago Ill. Price \$15
- The Growth, Replacement, and Types of Hair** by *J. B. Hamilton* and *A. E. Light* (Conference Chairman), *P. Alexander* *B. L. Baker* *R. S. Bear* *G. W. Bissell*, *R. J. Block*, *E. O. Butcher* *O. H. Duggins* *F. Ellinger* *N. C. Foot* *S. M. Gern*, *A. Giroud*, *M. H. Hardy* *L. P. Herrington*, *C. W. Laymon*, *C. P. Leblond*, *A. A. Li-bow*, *R. J. Myers* *C. R. Noback*, *J. P. Parnell*, *E. L. Reynolds* *H. J. Rago*, *W. F. Storey* *L. W. Thigpen*, *Al. Trotter* and *S. B. Wolbach*. Consulting Editor *J. B. Hamilton*. Editor *Roy Waldo Miner* Associate Editor *B. J. Heneghan*. Annals of the New York Academy of Science Volume 53, Art. 3 Page 461-752 288 pages; illustrated. New York Academy of Science New York, N. Y., publishers 1951 Price \$4
- Rice Dietary Controls and Blood Pressure With Menu and Recipe** by *Francis L. Seymour* M. D. 206 pages Froben Press Inc. New York N. Y. publisher 1951 Price \$2.95
- Handbook of Chemistry** A reference volume for ill requiring ready access to chemical and physical data used in laboratory work and manufacturing. Compiled and edited by *Norbert Adolph Lange* Ph. D., Lecturer in Chemistry at Cleveland College of Western Reserve University Member of the American Chemical Society and American Institute of Chemists. Assisted by *Gordon M. Forker* B. S. (Chem. Eng.) General Electric Company Cleveland Ohio 7th edition 1920 pages Handbook Publisher Inc. Sandusky Ohio publishers 1949 Price \$7



- Correlative Neuroanatomy** by *J.eph J. McDonald*, M. S., M. Sc. D. M. D.; *J.eph G. Christ*, A. B., M. D.; *J. ch Lang*, M. S., M. D. 5th edition. 180 pages 70 illustrations University Medical Publishers P lo Alto Calif., publishers 1950. Price \$3
- Fever Therapy** by *H. Worley Kendall*, M. D. F. A. C. P. Prof or of Physical Medicine and Rehabilitation University of Illinois Research and Educational Hospitals Chicago Ill. Publication Number 80 American Lecture Series. A Monograph in American Lectures in Physical Medicine 101 page illustrated. Charles C Thomas Publisher Springfield, Ill. 1951 Price \$2.
- Chronic Ulcerative Colitis (Thrombo-Ulcerative Colitis)**, by *J. Arnold Bergen*, M. D., Di lson of Medicine Mayo Clinic Rochester Minn Publication Number 101 American Lecture Ser A Monograph in American Lectures on Abdominal Viscera 62 pages illustrated. Charles C Thomas, Publisher Springfield Id, Ill. 1951 Price 2.
- Growth and Development of Children**, by *Ernest H. Watson*, M. D., Associate Professor and *George H. Lowrey* M. D. Instructor Department of Pediatrics and Communicable Diseases University of Michigan Medical School 260 pages illustrated. The Year Book Publishers, Inc., Chicago Ill., publishers 1951 Price \$5 75
- The Kidney Medical and Surgical Disease** by *Arthur C. Allen*, M. D., Pathologist, The James Ewing Hospital; Assistant Attending Pathologist, Memorial Cancer Center New York City; Attending Consultant in Pathology Veterans Administration Hospital, Bronx N Y 583 pages 115 illustrations Grun & Stratton, New York, N Y., publisher 1951 Price \$15
- The Kidney Structure and Function in Health and Disease** by *Homer W. Smith*, A. B. Sc. D. M. S., Prof or of Physiology New York University College of Medicine 1 049 page illustrated. Oxford University Press New York N Y., publishers 1951 Price \$12 50.
- Tuberculosis Among Children and Adults** by *J. Arthur Myer*, M. D. Ph. D., Physician in Charge Chest Clinic Students Health Service University of Minnesota Chief of Tuberculosis Service Minneapolis General Hospital Professor of Medicine Preventive Medicine and Public Health, Medical and Graduate School University of Minnesota Minneapolis Minn. with an introduction by *Allen K. Kneus*, M. D., Lat Lecturer in Medicine Johns Hopkins University; Past Editor American Review of Tuberculosis Baltimore Md. with chapters by *O. Theron Clagett*, M. D., F. A. C. S. *William S. Conklin*, M. D. F. C. C. P.; *Jerome R. Hand*, M. D., F. A. C. S. *Ralph C. Harrison*, M. D. F. A. C. P., F. A. C. S. F. C. C. P., *John D. Steel*, M. D. F. A. C. S. and *C. A. Stewart*, M. D., Ph. D. 3d edition. 894 pages illustrated Charles C Thomas Publisher Springfield, Ill., 1951 Price \$12 50
- Large Quantity Recipes** by *Margaret E. Terrell*, M. A., Prof or of Home Economics and Director of University Dining Halls, University of Washington, Seattle Caroons by *Jean McConnell*. Selected and Typed Under the Sponsorship of The American Dietetic Association. 414 pages; illustrated. J. B. Lippincott Co., Philadelphia P publisher 1951 Price \$7
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## BOOK REVIEWS

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**1950 Year Book of Dentistry** (August 1949 August 1950) edited by *Stanley D. Tylman*, D. D. S., M. S., Professor and Head of the Department of Prosthodontics University of Illinois College of Dentistry Chicago Ill. *Donald A. Keys*, D. D. S., Professor and Chairman of the Department of Operative Dentistry College of Dentistry University of Nebraska Lincoln, Nebr. *John W. Kwatson*, D. D. S., Dr. P. H., Dental Director Chief of the Division of Dental Public Health Public Health Service Washington D. C. *George R. Moore*, D. D. S., M. S., Professor and Head of the Department of Orthodontics, School of Dentistry University of Michigan, Ann Arbor Mich. *Hamilton G. B. Robinson*, D. D. S., Director Post-Graduate Division College of Dentistry Ohio State University Columbus Ohio and *Carl W. Waldron*, M. D., D. D. S., Clinical Professor of Oral Surgery University of Minnesota School of Dentistry Minneapolis, Minn. 525 page Illustrated The Year Book Publishers Inc Chicago Ill. publisher 1950 Price \$5

This series of abstracts by a group of men prominent in their respective fields covers articles published in medical and dental journals in this country and abroad between August 1949 and August 1950. The book brings us an impressive array of significant developments in the theoretical and practical phases of the art and science of dentistry. The articles are grouped in the following divisions: (1) diagnosis (2) dentistry for children (3) palpal and periodontal diseases and pathology (4) caries (5) public health (6) orthodontics (7) surgery and related pathology and (8) restorative and prosthetic dentistry. Some of the most significant recent developments described are the uses of streptomycin in dentistry and its proved effectiveness in patients with actinomycosis of the jaw, painful mouth ulceration, herpetic gingivostomatitis, and osteomyelitic bone conditions. In the field of public health the use of fluoride as a topical agent in both children and adults and fluorine in the water supply in proper quantity has been justified beyond question. One must read this work to appreciate the quantity and quality of current research in dentistry. The volume is of value to the busy practitioner because it enables him to keep abreast of these developments and to apply the best technique in his practice. The source of each abstract is given in a footnote for those who wish to read the original article.—*Capt. M. Dicker U. S. A. F. (DC)*

**Physiology of Shock** by *Carl J. Wiggers*, M. D., Sc. D., F. A. C. P., Professor of Physiology and Director, Department of Physiology, School of Medicine, Eastern Rensselaer University, 458 pages Illustrated The Commonwealth of New York, N. Y. publisher 1950 Price \$5

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- Enzymes and Enzyme Systems Their State in Nature* edited by John T. Edsall, A. L. Lehninger, David E. Green, Emil L. Smith, Andreas C. Mackay, Britton Chance, Edwin J. Cohn, Douglas M. Sargent and Margaret J. Hunter. 146 pages. Illustrated. Harvard University Press. Cambridge Mass. publishers. 1951. Price \$2.75.
- Immunology* by Noble Pierce Sherwood, Ph. D., M. D., F. A. C. P. Professor of Bacteriology University of Kansas, and Pathologist to the Lawrence Memorial Hospital, Lawrence, Kans. 3d edition. 791 pages. Illustrated. The C. V. Mosby Co., St. Louis Mo., publishers. 1951. Price \$8.
- Handbook of Pediatric Medical Emergencies* by Adolph G. DeSanctis, M. D., Professor of Pediatrics and Chairman of the Department of Pediatrics, Post-Graduate Medical School, New York University-Bellevue Medical Center, Director of Pediatrics, University Hospital, New York University-Bellevue Medical Center, Director of Pediatrics, Gouverneur Hospital, New York City and Charles Varga, M. D., Instructor in Pediatrics, Post-Graduate Medical School, New York University-Bellevue Medical Center; Assistant Attending Pediatrician, University Hospital, New York University-Bellevue Medical Center, Assistant Visiting Pediatrician, Gouverneur Hospital, New York City. 284 pages with 51 illustrations. The C. V. Mosby Co., St. Louis Mo. publishers, 1951. Price \$5.
- Yellow Fever* by George K. Stroud, M. D., Editor and John C. Bagher, M. D., J. Anst. Kerr, M. D., Hugh H. Smith, M. D., Kenneth C. Smithburn, M. D., Richard M. Taylor, M. D., Max Theiler, M. R. C. S., L. R. C. P., Andrew J. Warren, M. D. and Leroy Whitman, M. D. 710 pages. Illustrated. McGraw-Hill Book Co., Inc., New York N. Y., publishers. 1951. Price \$9.50.
- A Textbook of X-ray Diagnosis*, by British Authors in Four Volumes. Volume I. Edited by S. Cochrane Shenton, M. D. F. R. C. P. F. F. R., Director X-ray Diagnostic Department, University College Hospital, London; and Peter Kerley, M. D. F. R. C. P. F. F. R. D. M. R. E. Director X-ray Department, Westminster Hospital; Radiologist, Royal Chesh Hospital, London. 2d edition. 434 pages. Illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher. 1951. Price \$12.

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**Physiology of Shock** by *Carl J Wiggers* M. D. Sc. D. F. A. C. P. Professor of Physiology and Director Department of Physiology School of Medicine Western Reserve University 458 pages; illustrated. The Commonwealth Fund New York, N. Y. publisher 1950 Price \$5

This monograph has evolved from investigations which began over 40 years ago. During the past decade in his department at the School of Medicine of Western Reserve University the author has directed research on the peripheral circulation and shock. No one is better qualified to review the accumulated experimental and clinical data on this subject. The book is written primarily for those interested in the physiologic investigation of shock. The criteria of experimental shock, methods of producing experimental shock and a review

**Enzymes and Enzyme Systems Their State in Nature** edited by John T. Edsall, A. L. Lehninger, David E. Green, Emil L. Smith, Andreas C. Mehl, Britton Chance, Edwin J. Cohn, Douglas M. Sanger and Margaret J. Hunter. 146 pages illustrated. Harvard University Press, Cambridge Mass., publishers 1951. Price \$2.75.

**Immunology** by Noel Pierce Sherwood, Ph. D. M. D., F. A. C. P. Professor of Bacteriology University of Kansas, and Pathologist to the Lawrence Memorial Hospital, Lawrence, Kan. 3d edition. 791 pages illustrated. The C. V. Mosby Co., St. Louis, Mo. publisher 1951. Price \$8.

**Handbook of Pediatric Medical Emergencies** by Adolph G. DeSanctis, M. D. Professor of Pediatrics and Chairman of the Department of Pediatrics Post-Graduate Medical School, New York University-Bellevue Medical Center, Director of Pediatrics, University Hospital, New York University-Bellevue Medical Center, Director of Pediatrics, Gouverneur Hospital, New York City, and Charles Verge, M. D. Instructor in Pediatrics, Post-Graduate Medical School, New York University-Bellevue Medical Center, Assistant Attending Pediatrician, University Hospital, New York University-Bellevue Medical Center, Assistant Visiting Pediatrician, Gouverneur Hospital, New York City. 284 pages with 51 illustrations. The C. V. Mosby Co., St. Louis, Mo. publishers, 1951. Price \$5.

**Yellow Fever** by George K. Strode, M. D. Editor and John C. Bugher, M. D. J. Austin Kerr, M. D. Hugh H. South, M. D. Kenneth C. Smithburn, M. D. Richard M. Taylor, M. D., Max Theiler, M. R. C. S., L. R. C. P., Andrew J. Warren, M. D. and Loring Whitman, M. D. 710 pages illustrated. McGraw-Hill Book Co., Inc., New York, N. Y. publishers 1951. Price \$9.50.

**A Textbook of X-ray Diagnosis** by British Authors in Four Volumes. Volume I Edited by S. Cockburn Shanks, M. D. F. R. C. P. F. F. R., Director X-ray Diagnostic Department, University College Hospital, London; and Peter Kerley, M. D. F. R. C. P. F. F. R. D. M. R. E. Director X-ray Department, Westminster Hospital, Radiologist, Royal Chest Hospital, London. 2d edition. 434 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher 1951. Price \$12.

paper by Bodecker entitled *The Physiological Movement of Teeth*. In Part II McCall presents the most important writings of Chayes. These show a progression in the development of the movable-removable bridge from the early days when this method of treatment met with bitter opposition to the time when it was perfected and became widely accepted. Part III by Hugel opens with excellent chapters devoted to oral examination and case evaluation prior to restoration. The various steps in construction and repair of movable-removable bridgework are then explained. The authors are to be commended for the capable manner in which their material was prepared and presented. Minor printing errors appear in Part I.—*Capt. A. R. Frechette D. C. U. S. N.*

*Illustrations of Bandaging and First-Aid* Compiled by Lois Oakes S. R. N., D. N. (Leeds and London) Formerly Nursing Editor Nursing Illustrated. Late Sister-Tutor Walton Hospital Liverpool Nursing Technical Officer to Ministry of Labour Eastern Region Examiner to the General Nursing Council 4th edition 307 pages illustrated with 370 photographs The Williams and Wilkins Co. Baltimore Md. publisher 1950 Price \$2

Many excellent photographs of bandaging and the technique used in first aid are presented in this book. These help the student to master quickly the science and art of bandaging. The section on war wounds has been replaced by a new section dealing with eyeoplast and its application. This textbook is highly recommended for instructors and also for students taking a course in first aid.—*Lt. E. Pallekian NC, U. S. N.*

*Your Prostate Gland Letters from a Surgeon to His Father* by Reed M. Nesbit, M. D. Professor of Surgery University of Michigan Medical School Chief Section on Urology University Hospital Ann Arbor Mich. 50 pages Illustrations by Janet McLaughlin. Charles C. Thomas Publisher, Springfield Ill. 1950 Price \$2

To discuss a subject simply one must be thoroughly familiar with the material. The converse is not always true. Happily Dr. Nesbit has both attributes. This book is an unedited series of letters from the author to his father who requested information on this aspect of urology and it covers the basic anatomy and physiology of the prostate the way in which prostatic obstruction occurs the symptoms resulting from the enlargement a few of the sequelae associated with untreated cases non-surgical and surgical methods of treatment and the problems and prognosis pertinent to cancer of the prostate. The author warns the readers that this book is not to be used as a yardstick for self diagnosis. The tone of the letters is informal. Well-chosen similes are used. Historical landmarks of medical progress in this field are brought into focus. The author using the thesis that what one understands is rarely feared contributes most when he presents a detailed discussion of the four surgical methods of removing the prostate. It is recommended reading for patients contemplating prostatectomy and urologists who wish to describe in clearer language what is in store for their patients.—*Lt. P. L. Bates MC U. S. N.*

*Physical Diagnosis* by Ralph H. Major M. D. Professor of Medicine The University of Kansas. 4th edition 446 pages illustrated W. B. Saunders Co. Philadelphia, Pa. publisher 1951 Price \$6.50

This concise and readable text represents 15 years of experience in the teaching of physical diagnosis. The author has avoided such extraneous material as x-ray electrocardiography and other laboratory procedures. The illustrations are excellent. Much of the subject material and many of the illustrations are obtained from such authorities as Cabot, Rose and Flinn, Emerson, Norris and Landis, Pratt and Bushnell, Selfert and Muller, Edens and Letulle and others. This book is primarily a textbook for medical students and not an encyclopedia on physical diagnosis.

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method for studying the hemodynamics of shock are discussed in detail. The concept of oligemic and normovolemic shock is defined, and an experimental procedure has been devised which permits comparison of sequential events of oligemic and normovolemic shock in the same animal, thereby facilitating the evaluation of the change in blood volume and the effects of cardiovascular mechanisms. These basic hemodynamic changes are briefly illustrated by several charts which summarize the relative roles of the hydraulic and vascular factors.

The mechanisms of peripheral circulatory failure are considered under the subheadings of generalized changes in capillary permeability, sequestration and pooling of blood, capillary trapping, compressor mechanisms, and the changes in arterial pressure pulse. The role of myocardial insufficiency or depression in most cases of shock is studied by means of stroke volumes, equivalent venous pressures, intraventricular pressure changes and electrocardiographic criteria. Because shock caused by loss of blood or plasma includes more than disparity between blood volume and the vascular capacity, the author considers the oxidative and respiratory functions in shock, including oxygen consumption and transport, acidosis, tissue metabolism and enzyme systems, carbohydrate and protein metabolism, and then ties all factors together in a discussion of therapeutic implication.

In the last two chapters he evaluates the toxic and anergic factors that may play subsidiary or predominant roles in the development of shock, and discusses the involvement of the adrenals, liver, alimentary tract, and kidneys. Although the average clinician is likely to find this excellent book complex and tedious, all medical officers should read the chapter on clinical shock, the sections on therapeutic implications, the summary of sequential reactions in the development of shock, and the outline of challenging unsolved problems.

—Major J. C. Shender, U. S. A. F. (MC)

**Movable-Removable Bridgework, A System of Physiologic Bridge Work Devised by Herman E. S. Chayes, D. D. S., by John Oppel McCall, D. D. S., F. A. C. D., F. A. A. P.** Former Instructor of Periodontia, University of Buffalo; Former Instructor in Periodontia Extension Courses, Columbia University; Former Professor of Periodontia, New York University; Former Director, the Marry and Leon Guggenheim Dental Clinic, New York; Past President, American Academy of Periodontology and Isadore M. Hugel, D. D. S. Associate in practice and teaching with the late Herman E. S. Chayes, Former Instructor in Crown and Bridgework, New York University. Assistant Clinical Professor of Oral Surgery, New York University; Diplomate of the New York State Board of Oral Surgery; Member Omicron Kappa Upsilon, Member American Association of University Professors with chapter on The Physiologic Movement of Teeth by Charles F. Bodecker, D. D. S., F. A. C. D., Emeritus Professor of Dentistry (Histology), Columbia University College of Dental and Oral Surgery. Noted Researcher and Authority in Dental Histology. 221 pages; illustrated. Dental Items of Interest Publishing Co., Inc., Brooklyn, N. Y. 1950. Price \$7.50.

McCall states that this book was prepared to preserve record of Herman E. S. Chayes and to present in compact and readily accessible form the system of movable-removable bridgework which he developed and advocated. A very direct and frank preface establishes the qualification and interest of the authors in writing the book. The entire author sees the importance of the system of bridgework through the eyes of the periodontist, while the junior author endorses the system on the basis of years of its successful use. Part I is largely introductory and biographical. It sketches the early life of Chayes and highlights his professional career. A summary of the principles of the movable-removable bridge is included with arguments gathered from the literature for and against fixed bridgework. An appendix to Part I contains short

paper by Bodecker entitled *The Physiological Movement of Teeth*. In Part II McCall presents the most important writings of Chayes. These show a progression in the development of the movable-removable bridge from the early days when this method of treatment met with bitter opposition to the time when it was perfected and became widely accepted. Part III by Hugel opens with excellent chapters devoted to oral examination and case evaluation prior to restoration. The various steps in construction and repair of movable-removable bridgework are then explained. The authors are to be commended for the capable manner in which their material was prepared and presented. Minor printing errors appear in Part I.—*Capt. A. R. Frechette D C, U S N*

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**The Normal Electroencephalogram**, by **Leo M. Davidoff**, M. D., Director of Neurological Surgery, Beth Israel Hospital, New York City; Chief of Department of Neurosurgery, New York University Postgraduate Medical School, and **Cornelius G. Dyke**, M. D., Lecturer and Professor of Radiology, The College of Physicians and Surgeons, Columbia University, Late Director in the Department of Radiology of the Neurological Institute of New York, New York City. 3d edition, thoroughly revised by **Leo M. Davidoff**, M. D. 240 pages, 190 illustrations on 156 figures. Lea & Febiger, Philadelphia, P. publisher, 1951. Price \$6.

This companion volume, *The Abnormal Electroencephalogram*, planned by these authors was delayed by the death of Dr. Dyke, pioneer in the field and was recently published under the authorship of Davidoff and Epstein. The present edition of *The Normal Electroencephalogram* does not basically alter the highly satisfactory text of the previous editions. It brings the literature up to date and embodies a number of minor changes in text and illustration. Together with its companion volume this book should be consulted by all medical officers concerned in neurologic diagnosis.

—**LT. Col. S. B. Ransom, MC, U. S. A.**

**An Illustrated Study Aid for Medical Bacteriology**, by **Walter J. Nungesser**, Sc. D., M. D., and **Phoebe G. Williams**, B. A., Department of Bacteriology, University of Michigan. 92 pages, illustrated. Distributed by Ulrich Associates, Inc. 1950. Price \$2.50.

As stated in the preface, "This is not a book with permanent value but rather an inexpensive manual which we hope may be of value in supplementing the more formal presentations of text books and lectures." This manual contains many diagrams and drawings that would be valuable as teaching aids. Such subjects as the transmission of disease, sterilization, and immunity are graphically presented in such a simple fashion to be easily understood by student with no prior background. The sections on infectious diseases listed according to the system of organs affected, are well tabulated, and the characteristics of the causative organisms, laboratory diagnosis, treatment, and epidemiology. What text there is in outline form which does not lend itself to ease in reading or reference. Although some of the material has been oversimplified to the extent that it is of little value for teacher or student, many diagrams and sketches illustrating techniques that are difficult to describe such as subcutaneous chick embryo and yolk sac inoculations could well be reproduced as lantern slides or wall charts. The authors may have attempted to cover too wide a field. Subject ordinarily outside the scope of the usual course in medical bacteriology have received equal treatment. Protozoa, blood grouping, and serologic reactions which we included could have been left to manuals in this field. —**LT. Commander T. M. Floyd, MSC, U. S. N.**

**Recent Advances in Nutrition, with Particular Reference to Protein Metabolism**, by **Paul R. Cannon**, Ph. D., M. D., Chairman of the Department of Physiology, University of Chicago; in collaboration with **Earl P. Bendall**, M. D., **Lawrence E. Frazier**, M. A., **Eleanor M. Humphrey**, M. D., **Harold C. Steffee**, M. D., Ph. D., **Robert W. Wissler**, M. D., Ph. D., **Robert Woodbridge M. A. Potter**, Lecture Series 147, 74 pages, illustrated. University of Kansas Press, Lawrence, Kansas, publisher, 1950. Price \$2.

This excellent treatise on protein nutrition for the internist, dietitian, nutritionist, and student contains three lectures given to the faculty and students of the University of Kansas. The wasteful habits of processing food for the American market and the lack of food conservation in the home are stressed. A detailed discussion of the amino acid and protein metabolism is given. In view of the fact that carbohydrates, fat, vitamins, and minerals are not discussed the title is misleading. —**Col. F. W. Pruitt, MC, U. S. A.**

**Para Pro Toto Abbreviations in International Medical Literature Including Sister Sciences In Six Languages** by *Alfred Peyer* 196 pages Almquist & Wiksell Stockholm, Sweden, publisher 1950 Price 12 kr (about \$2.33).

This book fills a growing need resulting from the inevitable increase in the prevalence of initials and other abbreviations in medical literature. In it are listed in alphabetic order common English, French, German, Danish, Swedish, Italian, Spanish, Latin, and international abbreviations with their meanings. When appropriate the abbreviations are also identified with one or more special fields such as chemistry, dentistry, military medicine, et cetera. One of the chief value of the book is that it brings together under one cover material that would otherwise have to be sought (not always with success) in many volumes. It appears to be very complete except for the omission of terms specifically related to veterinary medicine.—*Col. W. G. Brandstadt, MC, U. S. A.*

**A Classified Bibliography of Gerontology and Geriatrics** Prepared for Stanford University under a grant from The Forest Park Foundation, Peoria, Illinois by *Nathan W. Shock*, Chief, Section on Gerontology, National Institutes of Health, and Baltimore City Hospitals. 599 pages. Stanford University Press, Stanford, Calif., publisher 1951. Price \$15.

In this bibliography are found references under alphabetically arranged subject headings from American and foreign journals. There is also a journal index and an author index. This volume places a tremendous amount of information in a ready available form, and should be of outstanding value to those interested in gerontology.—*R. Adm. G. W. Calver, MC, U. S. N. (Ret.)*

**The 1950 Year Book of Drug Therapy** (October 1949–September 1950) edited by *Harry B. Chown*, M. D., Director, Department of Pharmacology, Marquette University School of Medicine. 566 pages, illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers 1950. Price \$5.

With the continued rapid advances in therapeutics most practitioners will have frequent occasion to refer to this type of book. The editor, an acknowledged authority on therapeutics, has followed the usual Year Book pattern of conveniently grouped abstracts. Of necessity such a volume can be neither comprehensive nor authoritative, and yet the topics are exceptionally well-covered within the limit imposed by the format. Pungent editorial comments highlight many of the abstracts. It is highly recommended to all practitioners of medicine.—*Lieut. R. A. Maxon, MC, U. S. N.*

**Diseases of the Tropics** by *Georg Cheever Shattuck*, M. D., Professor of Tropical Medicine, Harvard Medical School and Harvard School of Public Health, Emeritus Consultant for Tropical Diseases, Boston City Hospital and Massachusetts General Hospital. 803 pages, illustrated. Appleton-Century-Crofts, Inc., New York, N. Y., publishers 1951. Price \$10.

Although the style of this book is terse and at times almost telegraphic, often reminiscent of the TB Meds issued by the War Department during World War II, which are referred to frequently, it has imparted a sense of haste in preparation which I find undesirable in textbooks. Certain inconsistencies appear in the text. For example, a large part of the section on the treatment of cholera, published in TB Med 138, 1945, is quoted, including the statement: "The clinical value of penicillin has not been determined." In the same chapter reference is made to the work of Reimann in China and the chapter closes with the statement: "Penicillin seems to be without effect in cholera."

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which followed antisyphilitic treatment were erroneously attributed in the past to arsphenamine. Such statements place too little emphasis on the toxic properties of the arsenicals. On page 453, in discussing the treatment of psittacosis the author states: *Aureomycin* is believed to be highly effective against the virus of psittacosis as well as against various other viruses. For example, Finland and others (1949) reported prompt improvement in a small series of cases of primary viral pneumonia. The virus was not identified. This seems a tenuous thread of proof for the effectiveness of therapeutic penicillin. On page 279, the following statement is made: "Vaccines have not been available in quantity but they are now being made and tested (Plotz and others, 1946). This is in reference to scrub typhus vaccine. In 1949 Berge, Gould and Kitzaka, and in 1950 Smadel, Bailey and Dicks demonstrated the ineffectiveness of scrub typhus vaccine. The above statements are examples and do not represent all of the questionable passages by any means. The arrangement is haphazard with Part I being devoted to the disease processes and Part VII to the intestinal processes, the rickettsial, bacterial, and viral diseases coming between. Furthermore Part III deals with rickettsial diseases, Part IV with bacterial diseases, and Part V with viral diseases. The book is not entirely without merit, however. The bulk of the information is accurate and many readers will no doubt like the style. The illustrations are profuse and in general are good. The color plates on malarial parasite and on the blood and tissue flagellates are excellent. —Col. R. P. Mason, MC, U. S. A.

**Functional Anatomy of the Limbs and Back, A Text for Students of Physical Therapy and Others Interested in the Locomotor Apparatus**, by F. Henry Hollashead, A. B., M. S., Ph. D. Head of the Section on Anatomy, Mayo Clinic, Rochester. Professor of Anatomy, Mayo Foundation, University of Minnesota. 341 pages illustrated. W. B. Saunders Co., Philadelphia, Pa. publisher 1951. Price \$6.

This monograph has been prepared as a text for students interested in the locomotor apparatus. Although the author prepared it primarily for students of physiotherapy its usefulness extends far beyond this particular group. It is so well organized that it will serve as an excellent reference source for the physician whose only connection with functional anatomy dates from his early medical school days. It will be particularly useful as a ready reference by orthopedic residents and interns, and useful in demonstrating disabilities to the patients themselves. The book is divided into five main sections covering (1) the organization of the body, (2) the upper limb, (3) the lower limb, (4) the back, and (5) the head, neck, and trunk. Line drawings are used throughout to illustrate articulations of the body with their primary movers. The clarity of illustration needs little explanation, but concise text describes each part and its function. Terms have been defined and simplified and the basic features of each major position of each musculoskeletal system are clearly described. The author has succeeded in drawing together and presenting in logical order facts and opinions which are usually widely scattered through various sections of the larger textbooks of anatomy and in original papers. This monograph is a definite contribution and should be available in all hospital libraries as well as on the book shelves of all students of bodily function. —Commander C. R. Carr, MC, U. S. N.

**Anatomy of the Nervous System**, by Olof Larsell, M. A., Ph. D., Sc. D. Professor of Anatomy, University of Oregon Medical School, Portland. Introduction by A. T. Rezniss, M. D., Ph. D. 2d edition. 520 pages illustrated. Appleton-Century-Crofts, Inc. New York, N. Y. publishers 1951. Price \$9.

This textbook is written primarily for the medical student who is taking course in neuroanatomy. In an orderly, progressive manner the author introduces the gross anatomy, embryology and histology of this complicated system.

By the liberal use of good illustrations in close relation to the written text the reader is enabled to assimilate the material more easily. A bibliography is appended at the end of each chapter. The author has purposely omitted illustrative case and other clinical examples because these can be presented by the instructor in the classroom.—*Lt. (jg) R. T. Donelan MC, U S. N. R.*

**Friend of the People** The Life of Dr. Peter F. Yassow of Charleston, South Carolina by *Chalmers G. Davidson*. 151 pages. Published by The Medical Association of South Carolina. 1950. Price \$2.75.

This is a biography of the first president of the Medical Association of South Carolina who was notable also as a patriot and civic leader. Throughout the entire period of the American Revolution he served in charge of the general hospital for the Army in the southern colonies. After the war he was leader of the movement against the concentration of power in the hand of the Federal Government so has the distinction of being one of the first of the States' Rights. The author has furnished a short but excellent bibliography.

—*Capt. L. H. Roddis MC, U S. N. (Ret.)*

**Trends in Gerontology** by *Nathan W. Shock*, Chief, Section on Gerontology, National Heart Institute, National Institutes of Health, and The Baltimore City Hospitals. 153 pages, illustrated. Stanford University Press, Stanford, Calif. publishers, 1951. Price \$2.50.

More people are growing old. This constitutes a problem for the laboring man himself, his employer, and the union to which he belongs. When the answer is not harmoniously achieved, then the problem becomes one for the civil authorities as the worker becomes a public care and needs charitable and public support. The approach to this problem belongs in the field of gerontology and is discussed by the author from the various approaches from the trends in population change, through education, housing, employment, and maintenance in retirement. The book is well written, easily understood, and is a build-up for the establishment of a separate institute instead of a new section within the National Institute of Health.

I disagree completely with the premise that old people must be taken care of by their family or the community. Just as we train children to develop into adults, so must we train adults to be able to adjust themselves to the problem of a life-support and keeping a life-respect and independence in their later years. This should not be a responsibility of the Federal Government. If a person is to be worth while, his self-respect and independence must be allowed to develop. These characteristics are rapidly being destroyed by our failure to stimulate a man to solve his own problems. The well-doers find their jobs increased by the greater number they can find to care for, and so it is good policy for them to create a feeling of dependency and need for support among their clientele. Many of these problems are well covered by the author, and for that reason alone, *Trends in Gerontology* is worth reading.

The unions representing labor and the industrialists representing capital are already alert to this problem. If a man has a hobby before he reaches 40, he will be an expert in his hobby by the time he has reached retirement age. Countless people have found their hobbies have become a more creative and pleasant source of income than their usual occupation. Let enough people be independent and have self-confidence, and their problems of aging will be easy. A person who is working will be more contented than one who could be occupied but does not know how. We can never escape our responsibility for the physically unfit and mentally unfortunate. That is a local and State problem, however. Every person must be encouraged to make a path for himself in the world of today, and the problem for tomorrow will be solved. A man must learn his responsibility to be worthy of his life.

—*R. Adam C. W. CALVERT MC (R) (Ret.)*

**The Use of Pedicle Flaps of Skin in Plastic Surgery of the Head and Neck**, by Gordon B. New, M. D. F. A. C. S. Professor of Plastic Surgery and John B. Erick, M. D. F. A. C. S. Associate Professor of Plastic Surgery Both of Graduate School, University of Minnesota Minneapolis and Section on Laryngology Oral and Plastic Surgery Mayo Clinic Rochester Minn. Publication Number 56, American Lecture Series. 104 page illustrated. Charles C Thomas Publisher Springfield, Ill., 1950 Price \$3.

The author of this monograph have presented a concise description with excellent illustration of the use of standard procedures in reconstructive operation on the head and neck. The first chapter defines the terms used and discusses the physiologic changes that occur in the transfer and the establishment of the new circulation in the transferred flap. Chapter 2 deals with the general uses of flaps for the head and neck. The authors list the following indications for the use of flaps: (1) chronic inflammatory lesions that will not heal; (2) severely scarred areas and contracture; (3) exposed bone; (4) perforation; (5) need of subcutaneous fat; and (6) reconstruction of organs: eyelids, nose, etc. In chapter 3 the planning and formation of the flaps, either simple or tubed, the method of outlining, and the means of transposition, bridging and burying are presented. The next two chapters take up single and double pedicle flaps respectively. Chapter 6 presents in outline form the flaps used by the authors with the advantages and disadvantages of each. Chapter 7 discusses the lining of flaps by (1) adjacent tissue, (2) folding in of the distal end of the flap and (3) free grafts. Chapter 8 deals with levator delay and true plantation of various forehead, scalp, and upper trunk pedicle flaps and tubes for correction of facial defects. The last chapter is devoted to flaps which are considered by the author to be best-suited for covering head and neck defects of various sizes and from various cause.

The book presents a brief discussion of the use of flaps in reconstruction of the head and neck. The plan of the flap is well-described, the locations are standardized and the technical description of each should serve as a reference for the planning of flaps of the head and neck.

—Commander J. T. Gossard, MC, U. S. N.

**James Lind, Founder of Naval Medicine** by Louis H. Ridd, Captain, Medical Corps U. S. Navy. 177 pages. Henry Schuman, Inc., New York, N. Y. publishers. 1950. Price \$3.

James Lind, right to the title Founder of Naval Medicine, convincingly set forth in this very readable book, which presents well-documented appraisal of the 18th century British naval surgeon's accomplishments. The scope of his achievement in the control of disease and in naval hygiene and sanitation justify his place among the great men of medical history. The value of Dr. Lind's work was recognized in his own period, or only in England but on the continent where his writings were published in four translations. Since his death however the importance of his work has been even more fully appreciated. He has been the subject of several biographic sketches during this century but he remained for the author of this book to demonstrate his full stature in the field of medical history.

Lind's pre-eminent accomplishment lay in demonstrating the efficacy of citrus fruit juice in the prevention and cure of scurvy. Scurvy is said to have caused more deaths among sailors than all other hazards of the sea including the wars of 300 years. It was not uncommon for half the crew of a ship to die of scurvy on a single voyage. Yet within years after Lind experimentally proved remedy was adopted by the British Navy, scurvy had practically disappeared from the fleet. From its position as the most dreaded killer on the high sea, scurvy dropped almost overnight to that of an occasional nuisance. This momentous advance disease control was achieved without repercussions on the home front because of the resulting shortage of citrus fruit. The

author quotes an exasperated lady who was unable to get oranges for her parties because this physician can persuade Lord Howe (Admiral of the Fleet) to anything.

Lind's life and work are presented in a rich background of 18th century naval life. The composite picture of a naval surgeon in the reign of King George II as drawn from contemporary writings is described with the directness of an eye witness account. The hardships of life at sea which seem to have been rather casually accepted at the time are made vivid through the judicious use of quotations from journals and letters of the period. This makes highly interesting and entertaining reading with an appeal not limited to medical or naval personnel.—*Capt. R. L. Ware MC, U S N*

**The Practice of Sanitation**, by *Edward S. Hopkins* Principal Associate Engineer Bureau Water Supply Baltimore Md. Lieutenant Colonel Medical Service Corps (Sanitary Engineering Section) United States Army Reserve Instructor McCoy College John Hopkins University formerly Special Lecturer Western Maryland College and *Francis B. Elde* Engineering Associate American Public Health Association, Colonel Medical Service Corps (Sanitary Engineering Section) United States Army Reserve 423 pages illustrated The Williams & Wilkins Co. Baltimore Md. publishers 1951 Price \$7.50

In the foreword Professor Wolman points to the relationship between the will to live and the developments in environmental sanitation in this country. The authors have attempted to survey these developments briefly for the beginner in this field and have done so with very few omissions. Starting out with fundamental concepts they proceed to a discussion of the principle of disinfection the sanitary survey food milk water sewage stream pollution refuse disposal ventilation swimming pools insect and rodent control and administrative procedures. Into a separate chapter on environmental sanitation and the public health they have placed such miscellaneous items as air pollution housing noise abatement industrial sanitation public buildings rail water and transportation and camps of various sorts. References are placed at the end of every chapter. Some but not all chapters end with a summary or conclusion. The illustrations are well chosen. The author index is separate from the subject index.

In the discussion of the chlorination of water no mention is made of breakpoint chlorination as this was probably considered too technical a point for the group the book is expected to reach. It is unfortunate that in discussing rodenticides no mention is made of warfarin or of the new repellents. Despite the minor criticisms the book is admirably suited for the teacher the general student, the nurse sanitarian layman or health officer. I know of no other ready reference which brings so much current knowledge under one cover in such a easily readable style.—*Col. F. G. Brandt, MC, U S A.*

**Toxicology of Uranium, Survey and Collected Papers** edited by *Albert Tannenbaum*, A. D. Director Department of Cancer Research Medical Research Institute Michael Reese Hospital, Chicago formerly Senior Chemist and Toxicologist Cook County Coroner's Laboratory Chicago 333 pages illustrated McGraw-Hill Book Co. Inc. New York N. Y. publishers 1951 Price \$3

This volume in the Nuclear Energy Series summarizes the pharmacological studies on injected and ingested uranium compounds. The investigations were carried out at the Metallurgical Laboratory (Manhattan Project) between 1942 and 1946. Part 1 gives a review and general discussion of uranium poisoning. Part 2 is a collection of 16 papers covering various aspects of the problem. The toxicity of uranium does not result from its radioactive properties but is caused mainly by its nephrotoxic action similar to that of many other heavy metals. Uranium appears to be less of a toxicological hazard than is mercury.



**The Use of Pedicle Flaps of Skin in Plastic Surgery of the Head and Neck**, by Gordon B. New, M. D. F. A. C. S., Professor of Plastic Surgery and John B. Ellis, M. D. F. A. C. S., Associate Professor of Plastic Surgery, both of Graduate School, University of Minnesota, Minneapolis and Section on Laryngology, Oral and Plastic Surgery, Mayo Clinic, Rochester, Minn. Publication Number 36, American Lecture Series, 104 page illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$3.

The authors of this monograph have presented a concise description with excellent illustration of the use of standard procedure in reconstructive operations on the head and neck. The first chapter defines the terms used and discusses the physiologic change that occur in the transfer and the establishment of the new circulation to the transferred flap. Chapter 2 deals with the general use of flaps for the head and neck. The author lists the following indications for the use of flaps: (1) chronic inflammatory ulcerations that will not heal; (2) severely scarred areas and contractures; (3) exposed bone; (4) perforations; (5) need of subcutaneous fat; and (6) reconstruction of eyelids, nose, etc. etc. In chapter 3 the planning and formation of the flaps, whether simple or tubed, the method of outlining, and the means of transmissal, bridging and basing are presented. The next two chapters take up single and double pedicle flaps respectively. Chapter 6 presents in outline form the flaps used by the authors with the advantages and disadvantages of each. Chapter 7 discusses the lining of flaps by (1) adjacent tissue; (2) folding in of the distal end of the flap; and (3) free grafts. Chapter 8 deals with levator delay and transplantation of various forehead, scalp, and upper trunk pedicle flaps and tubes for correction of facial defects. The last chapter is devoted to flaps which are considered by the author to be best-suited for covering head and neck defects of various sizes and from various causes.

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—Commander H. C. Dudley, MSC, U. S. N.

**Nitrous Oxide-Oxygen Anesthesia**, by F. W. Clement, M. D., Diplomate American Board of Anesthesiology; Fellow of the International College of Anesthetists; Fellow of the American College of Anesthetists; Member of the International Anesthesia Research Society; Member of the Ohio Society of Anesthetists; Chairman of the Section on Anesthesiology of the A. M. A., 1950; Past President of the Mid-Western Society of Anesthetists, 1932; Past President of the Association of Anesthetists of the U. S. and Canada, 1938; Formerly Director of Anesthesia at Flower Hospital, Mercy Hospital, The State Hospital for the Insane, Lack County Hospital, and Toledo Dental Dispensary; Staff Anesthetist to Toledo and St. Vincent Hospitals; World War I—C. A. M. C. and R. A. M. C., 1914-1920; World War II—M. C. A. U. S., A. A. F., 1942-1945. 3d edition. 369 pages. 129 illustrations. Lea & Febiger, Philadelphia, Pa. publishers, 1951. Price \$6.50.

In this new edition the author has improved his presentation by rearranging his material. The book is well written and includes an adequate bibliography. Preoperative examination is emphasized; classification of anesthetic risk and premedication for children and adults are covered in detail. Dr. Clement reviews the cause, symptoms and treatment of shock with the easy recognition and prevention. He describes depression of under carbon dioxide and oxygen anesthesia to detect early shock. Endotracheal anesthesia and carbon dioxide absorption are discussed and the use of curare is advocated. There are many excellent illustrations of machines, equipment, and technique and a large section devoted to dental anesthesia. The author describes his technique in great detail with specific instruction. Although his use of the term maximum and minimum oxygen are vague. Although he insists throughout that his carbon dioxide and oxygen anesthesia is not hypoxic and does not cause cyanosis and hypoxia in relation to carbon dioxide and oxygen anesthesia it is hard to believe that restricted oxygen intake (100 percent carbon oxide induction) does not lead to lowered blood oxygen which is undesirable if maintained for any length of time even in the best of individuals as the dangers of oxygen lack with other anesthetic gases. The short summaries given at the end of each chapter bound to perpetuate maxima for the anesthetist.—Commander D. J. Giorgio, MC, U. S. N.

**Chemistry Visualized and Applied**, by Armand Joseph Cosceche, Instructor in Biological Chemistry, Hahnemann Medical College and School of Science; Instructor, Hahnemann Hospital School of Nursing, Philadelphia; formerly Laboratory Supervisor, Human Serum Albumin Department, Sharp & Dohme Inc., Glenolden, and Chemical Analyst, Allied Chemical & Dy Corporation, Barrett Division, Philadelphia. Edited by R. Cordeiro Cowen, with drawings by Richard Alberty. 687 pages. Illustrated. G. P. Putnam Sons, New York, N. Y. publisher, 1950. Price \$5.50.

This is a rather good attempt to encompass the fundamentals of inorganic, organic, physical and biological chemistry into a single small volume. It includes recent developments in many specialties such as radioactivity, isotopes, steroid chemistry, etc. Designed for students with no previous training in chemistry the material is limited to a simple introduction to chemistry.

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—Lt. Col M. E. Freeman, NSC, U S A

**The External Secretion of the Pancreas**, by J. Earl Thomas M.D. Professor of Physiology Jefferson Medical College of Philadelphia Philadelphia Pa. Publication Number 45 American Lecture Series 149 pages, illustrated Charles C Thomas Publisher Springfield, Ill. 1950 Price \$3.50

This is a monograph in the American Lectures in Physiology series. Printed in easily-read type on good paper this book sets forth in concise form the pertinent facts concerning the morphology of the pancreas experimental methods of studying it, the pancreatic juice functions of its external secretion stimuli for the pancreas secretin and pancreozymin the functional innervation of the pancreas and the mechanism of pancreatic secretion. There is an extensive bibliography at the end of each chapter as well as an author and subject index for the book. This book should be of interest to those desiring a concise summary of the physiology of the external secretion of the pancreas. It is not a textbook of disease of the pancreas.

—Commander H. J. Alvis MC U S N

**Orthopaedic Surgery** by Walter Mercer M.B. Ch.B. F.R.C.S. (Edin.) F.R.S. (Edin) Professor of Orthopaedic Surgery University of Edinburgh Director of Orthopaedic Service to the South-Eastern Regional Hospital Board Scotland. Formerly Surgeon, Royal Infirmary Edinburgh, Lecturer in Clinical Surgery University of Edinburgh Surgeon in Surgical Tuberculosis to the South-Eastern Councils of Scotland Joint Sanatorium, East Fortune Surgeon Ministry of Pensions Hospital Edenhall Consultant Surgeon Clinic for Limbless Pensioners Edinburgh Consultant Surgeon in Orthopaedics Emergency Medical Services Department of Health for Scotland Consultant Surgeon Chalmers Hospital for the Sick and Hurt Edinburgh Surgeon to Selkirk and Galashiels Cottage Hospital Surgeon-in-Charge Tynecastle Orthopaedic Clinic Specialist in Operative Surgery Edinburgh War Hospital Bangor Examiner in Medical Electricity Chartered Society of Physiotherapy Consultant Surgeon, Tynecastle Orthopaedic Clinic Ministry of Pensions President, Scottish Local Board Chartered Society of Physiotherapy with a foreword by Sir John Fraser Bt. K. C. V. O. M. C. F. R. S. Ed. F. R. C. S. Ed. M. D. Ch. M. F. R. A. C. S. F. A. C. S. Regius Professor of Clinical Surgery in the University of Edinburgh 4th edition. 1016 pages illustrated The Williams & Wilkins Co. Baltimore Md. publisher 1950 Price \$10

Keeping pace with the broadening and changing effect of war lessons on orthopaedic surgery the author has thoroughly revised and enlarged his valuable and readable textbook. Many illustrations have been added and many others have been replaced. The author illustrates the comparative new (1948) Denis Brown splint for congenital hip dislocation, but his section on congenital pseudarthrosis is not yet up to date. He quotes Pott's series of 13 with 11 failures but omits Moore's series of 8 successful osteosyntheses with os novum. The nondefinitive massage heliotherapy contrast baths and diets of the third edition have been omitted.

The chapter on general affection of the skeleton now includes sections on the role of blood in bone formation and one on fibrous dysplasia. His description of physiologic chemistry are examples of clarity and brevity. e.g. an increased blood flow will rapidly remove the carbon dioxide

or lead. Although the volumes unfortunately do not present all the available literature on the toxicology of uranium since there are few references to recently declassified material and the latest open reference is dated 1948, it will undoubtedly become standard reference on uranium. A study of details of the experimental procedure will provide many helpful hints as the method of attack on other toxicologic problems. The format relating references, and cross-indexing show workmanlike job by the editor and publisher.

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produced by the metabolism of the vitamin D which increases the solubility of calcium, and decalcification occurs. The chapter on non-tuberculous affection of joints particularly with reference to venereal diseases, has been changed to conform with the changed clinical findings in the field which have resulted from the increased availability of the antibiotics. Sections on Still disease, Reiter's disease, F. typhoid, and gonorrhea have been added to the chapter on chronic arthritis. No reference to the Judet or other hip prosthesis was noted in the discussion of operative treatment of arthritis of the hip and chondromyoma is still included as a therapeutic method, although many surgeons no longer consider chondromyoma or acetabuloplasty even temporarily palliative. Figure 201 captioned "Osteoarthritis" shows roentgenogram of hand with ulnar deviation of the fingers, luxation of the metacarpophalangeal joints, marked bone atrophy and loss of the lippling, which seems more typical of rheumatoid arthritis.

The chapter on affection of the spine omits the illustration of the transabdominal fusion for spondylolisthesis and all the description of Ober's fasciotomy, Klippel's operation, the removal of hemivertebra and the roentgenogram of Kummel's case. The latter has been replaced with an extremely good roentgenogram of Calvé's case. Additions include heart cooperating pyogenic and tuberculous spondylitis and greatly enlarged erosion on base of the nucleus pulposus. The pain heart (Figure 299) is not referred to in the 10 pages of text preceding the following.

In the chapter on complications of trauma the section on delayed union of fractures has been improved by the addition of a paragraph discussing inadequate immobilization, cause of delayed union and by the omission of references to parathyroid extract to promote bone healing, the McMillan bone chip inlay graft, and Whitman's method of treatment of fire arm femoral neck fractures. Reconstruction of un-united hip fractures is devoted more strongly than before but the geometric osteotomy of Dickson on which is proceeding as satisfactory is not mentioned. The author does however discuss the graft and nail combination of Dickson, and Patrick's success with this type of fixation.

There is no reference to type of femoral neck fracture nor to Ashworth's classification of ankle fractures. The section on malunions of Peet's fractures has been revised. The section on os calcis fracture does not mention the open reduction of Palmer, nor the total excision of the calcaneus by Pridie. A few words have been added on flexion contracture of the knee however there is no mention of the intramedullary fixation of fractures of the shaft of the femur even in relation to pathologic fractures or of g-shortening operations. This book was written in response to requests from postgraduates and undergraduate students and is primarily for the young surgeon, but there are many items which would interest even the experienced orthopedist. The organization is a few times important, and generally of topics that might be considered controversial. The book is clearly written, gratifyingly brief, well indexed, and packed with useful and practical information.

—Col. M. S. Thompson, MC, U. S. A.

**Toxemia of Pregnancy.** Human and Veterinary. A Ciba Foundation Symposium, edited by John Hammond, M. A., D. Sc., F. R. S., F. J. Browne, M. D., D. Sc., F. R. C. S., F. R. C. O. G. and G. E. W. Felsch, M. B., O. B. E., M. D., 277 pages, 93 illustrations. The Blackiston Co. Philadelphia, Pa. publishers 1950. Price \$4.50.

This publication contains in addition to the final 3 essays from the standpoint of the veterinarian, internist, and obstetrician 26 papers which deal with several obscure complications occurring in non-pregnant human beings and cattle. Although the majority of the contributors are from England and Scotland, a few European countries and the United States.

America are represented. The various symptoms and findings presented in the 6 papers on toxemias in veterinary medicine are suggestive of nutritional disturbances caused by acute deficiency diseases. Comparable conditions in human beings are acute yellow atrophy and hyperemesis gravidarum which differ from the preeclampsia-eclampsia syndrome. Several papers on the circulation in pregnancy reveal the need for further study and experiment in view of our present fragmentary knowledge. Ischemia of the uterus is suggested as a probable factor in the causation of toxemia.

The physiology of pregnancy and pathologic lesions in the hypertensive toxemias of pregnancy are well outlined. Studies regarding mono-amine oxidase activity of the placenta, thromboplastin complications and histaminase in pregnancy are excellent contributions to our knowledge of the biochemistry of placental tissue. The papers regarding the endocrine status of pregnancy deal primarily with the hormones of placental origin and little discussion or reference is made to the possible role of the adrenal cortex hormones in causing toxemia. In spite of the studies recorded here and elsewhere by many contributors of accepted international repute in the subject, the cause and pathogenesis of preeclampsia remains obscure. This book serves the useful purpose of presenting considerable knowledge without attempting to gain the acceptance of one particular theory. For this reason it will prove interesting to the medical student, clinician and workers primarily concerned with the basic sciences. It can be used as a basis for future research which will probably require the combined efforts of the clinician and his laboratory colleagues to clarify the situation.—*Commander E. B. Hopper MC, U S N*

**Injuries to the Ankle** by *J. Grant Bonnin, M. B. B. S. (Melbourne)*; *F. R. C. S. (England)*; Orthopaedic Surgeon, Central Middlesex Hospital; L. to Orthopaedic Registrar, West London Hospital; Acting Registrar, Royal National Orthopaedic Hospital; Orthopaedic Surgeon, E. M. S., Whit Lodge Hospital; Lieutenant-Colonel R. A. M. C., Orthopaedic Adviser, South East Asia Command; Hunterian Professor, Royal College of Surgeons. 412 pages, illustrated. Grune & Stratton, New York, N. Y. published 1950. Price \$8.50.

This interesting book covers its subject thoroughly. It is filled with timely information concerning all types of injuries to the ankle, but for most readers this information is buried in a minute description of how these injuries occur. Thus the work is at once restricted to the research-minded reader and thereby loses much of its potential value. It is to be hoped that the average practicing physician, the radiologist, and the student will read this book with interest. The orthopedist, but it is feared that the author has made his treatment too technical to attract this group of readers. Chapter 3 is especially useful in showing a positive method for differentiating sprains from ruptures of the ligaments. The author uses the term sprain in the case of an unruptured ligament, or as we say strain. This reviewer has used the strain diagram for several years and to this single method of examination is credited the almost total lack of so-called chronic sprains developing from acute injury. This book is of great value in providing a ready source for explanation of this method of examination. In so well illustrated a book there should have been some diagrams illustrating methods of this type. The description of the actual performance of these tests on the patient could also have been clearer for in actual practice this is not as easily performed as the terms inversion and version lead on to a surmise.

There is an excellent historical chapter followed by a detailed and well illustrated description of the anatomy of the ankle. There follows a minutiae of detail concerning the mechanisms of fracture and sprains which makes up three-quarters of the book. This will undoubtedly come to be the authority in English on this particular subject. As the author points out in his preface



the glossary should be read first, many of the terms used in the book differ from our usual conceptions. This volume will undoubtedly be well received among orthopedists and should be on every hospital and reference library shelf.—*Commander H. T. Stradford, MC, U. S. N.*

**A Textbook of the Practice of Medicine** by various authors. Edited by Frederick W. Price, F. R. S. Ed., M. D., C. M. Ed., F. R. C. P. Lond., Hon. M. D. Belg., Consulting Physician to the Royal Northern Hospital and to The National Hospital for Diseases of the Heart, London; formerly Physician and Honorary Pathologist to The Mount Vernon Hospital for Consumption and Diseases of the Chest, and Examiner in Medicine to The University of St. Andrews 8th edition. 2,076 pages. Geoffrey Cumberlege Oxford University Press. New York, N. Y. publishers 1950. Price \$9.

This new edition has been thoroughly revised, many articles have been entirely rewritten and several new articles have been added. The subject matter is divided into 20 sections covering all the subdivisions of medicine each written by recognized authority. The material is presented in clear, concise manner the emphasis being placed on diagnosis, prognosis and treatment. Because of recent advances in therapy particularly by newer antibiotics some of the material on treatment is already outdated but this defect is inherent in work of this type and does not detract from its value. The book is an authoritative and readable text on the practice of medicine and worth-while addition to any medical library.—*Col. C. A. Best, MC, U. S. A.*

**Periodontia. Clinical Pathology and Treatment of the Periodontal Tissue** by Edgar D. Coolidge, B. S. M. S., D. D. S., LL. D. (Hon. Loyola), Professor Emeritus of Therapeutics Preventive Dentistry and Oral Hygiene Chicago College of Dental Surgery School of Dentistry Loyola University Chicago, Ill. formerly Professor of Materia Medica Pharmacology and Therapeutics of the School of Dentistry University of Illinois and Raymond K. Hirs, M. S., D. D. S., Professor of Periodontia and Histopathology and Dean Indiana University School of Dentistry formerly Rockefeller Fellow in Dentistry and Carnegie Fellow Dentistry Rochester School of Medicine and Dentistry and Assistant Professor of Dental Pathology and Therapeutics School of Dentistry University of Illinois Chicago, Ill. 318 pag. 378 illustrations on 219 figures and 2 colored plates. Lea & Febiger Philadelphia Pa. publishers 1951 Price \$6

This book will give the reader sound, fundamental knowledge of periodontal disease and acceptable method of treatment. The subject is presented in logical sequence beginning with the normal, healthy periodontal tissue and proceeding to the gradual tissue change that develop with inflammation the degenerative periodontal changes associated with certain systemic disorders the influence of trauma and the importance of home care.

The discussion of the pathologic change in the periodontal structure is concise and readily understandable presenting a graphic description of cellular reaction to inflammation, the degenerative change seen in periodontitis, periodontal atrophy and trauma, and the progressive tissue change of inflammatory and fibrous hyperplasia. The authors identify gingival enlargement either inflammatory or fibrous hyperplasia eliminating the term gingival hypertrophy. They state: Hypertrophy of the gingival tissue commonly called hypertrophic gingivitis, is collective term for condition in which there is an increase in size of the gingival tissue.

The treatment of gingivitis caused by local irritation is thoroughly discussed, well the physiologic process involved in the deposition of calculus. A section on gingivitis caused by infection is mostly concerned with

Vincent's infection or as the authors prefer to call it necrotizing gingivitis. The cause, symptoms, microscopic findings and pathogenicity are completely and logically discussed. The section which deals with the treatment of acute necrotizing gingivitis is disappointing because of the great emphasis placed on drug therapy. The most effective method of treatment is debatable. No method is effective however that does not have as its prime objective the elimination of all local irritating factors, or the improvement of systemic conditions which may be interfering with the health of the oral tissues and may have caused them to become susceptible to infection. The authors are in agreement on this point but because this chapter describes the treatment of this infection with oxidizing agents, mercurial derivative, aniline dyes, caustics, arsenicals, sulfonamides and antibiotics in great detail it would appear that the use of these preparations is of primary importance in eliminating this infection.

Adequate consideration is given to oral manifestations of systemic disturbances such as gingivitis caused by dietary deficiency or faulty metabolism, and blood dyscrasias. A description of many miscellaneous oral conditions is included. The view of the authors on the causation, pathologic change, management, and prognosis of periodontitis and periodontosis follow the accepted teachings and are well illustrated. The chapter dealing with the function of response to occlusal stress and the treatment of trauma is excellent, as well as the discussion on the importance of home care in the treatment of periodontal disease. This book is well illustrated, contains an ample bibliography and for the most part, deals thoroughly and rationally with periodontal problems.—*LT. COL. D. B. Lenker, U. S. A. F. (MC)*

**Diathermy: The Use of High Frequency Currents**, by *Stafford L. Osborn*  
B. P. E. M. S. Ph. D. Professor and Chairman, Department of Physical Medicine, Northwestern University Medical School. Publication Number 91, American Lecture Series, 113 pages, illustrated. Charles C. Thomas, Publisher, Springfield, Ill. 1950. Price \$3.

This book presents in a concise manner the use of all types of high-frequency currents in the treatment of pathologic processes. Conventional short wave and microwave diathermy are all well described and a short chapter is included on the principles of surgical diathermy. The indications and contraindications for each type of diathermy are well defined and the technique of their application for each part of the body are clearly described and admirably illustrated. This book will prove extremely useful as a reference for all physical therapy technicians and physiatrists and will serve as a handy guide to all physicians who have occasion to prescribe the application of high-frequency currents.—*Commander H. S. Etter MC, U. S. N.*

**Fundamentals of Clinical Fluoroscopy With Essentials of Roentgen Interpretation**, by *Charles B. Storck*, M. D. Adjunct, Radiodiagnostic Department and Radiotherapy Department, Beth El Hospital, Brooklyn, N. Y. 196 pages, illustrated. Grune & Stratton, New York, N. Y. publishers. 1951. Price \$6.75.

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fluoroscopic appearance of the various cardiac chambers in normal and abnormal conditions. The author has handled this subject extremely well. The essentials of roentgen interpretation mentioned in the subtitle are given in a subordinate role in the text but roentgenography and fluoroscopy are so closely related that sharp division is not possible.—Col. H. L. Amory MC, U. S. A.

The American Red Cross, A History by Foster Rheas Dulle 354 pages. Harper & Brothers New York, N. Y. publishers 1950 Price \$5

This book describes the founding of the American Red Cross 70 years ago its pioneer days under Clara Barton, the reorganization and the new developments; the beginning of the twentieth century the great expansion under the War Council during World War I the readjustments of the years of peace the effect of the New Deal on the program, and the record of the Red Cross in World War II. The author defines the American Red Cross as an agency of the American people supported by them, and reflecting their prevailing temper. He notes the untold times of war the citizens contributed in every possible way volunteers from all economic levels worked aid by day and night in camps, in hospitals and wherever needed. Membership expanded and fund drives exceeded quotas. In contrast to this fault finding, and criticism, both of the organization and of its individual members is still in peace time. The peacetime programs, such as, promotion of public health and national blood program lacked the dramatic appeal of the war time program. During the years of the depression the government assumed the responsibility of many of the programs, for which the Red Cross previously had been responsible. This was acceptable to the Red Cross its primary function was to meet the need of the American people which could not be met in any other way.

This book is an excellent history of the American Red Cross as an organization. It briefly depicts the impact of modern scientific technology and social change on an organization in a democratic society. It is recommended as an excellent reference work for the student of social sciences.

—Lt. (jg) O. C. Upchurch, MC, U. S. N.





# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
Agency Department of Defense*



FREDERIC W. FARRAR, Captain MC U S N., Editor in Chief  
WAYNE G. BRANDSTADT, Colonel MC U S A, Associate Editor  
ROBERT J. BENFORD, Colonel U S A F (MC), Associate Editor

THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY  
THE DIRECTOR OF THE BUREAU OF THE BUDGET OCT 18 1949

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON 1951

For sale by the Superintendent of Documents, U. S. Government Printing Office  
Washington 25 D. C.



## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

The Chairman of the Armed Forces Medical Policy Council and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army Navy and Air Force to submit manuscripts for publication in this JOURNAL.

RICHARD L. MEILING M. D.

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Medical Policy Council,  
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Contributions to the *Medical Journal* should be typewritten, double-spaced with wide margins on plain paper of standard letter size. Nothing should be written in the manuscript that is not intended for publication.

The *Medical Journal* endeavors to follow a uniform style in headings, captions, spelling, abbreviations, capitalizations, and the use of figures as set forth in the Government Printing Office Style Manual.

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Contributions are to be the original work of the author. Quotations must be accurately and carefully copied and full credit must be given to the source. References, tables (charts) and legends must be double-spaced and on separate sheets. References should be listed according to the Quarterly Cumulative Index Medicus, A. M. A., and the sequence should be as follows: name of the author and initials; title of article; name of periodical; volume; number; pages; and month and year. *Example:* Hinton D., and Steiner O. A. Recurrent volvulus of sigmoid colon: unusual case report. *Ann. Surg.* 116: 147-149, July 1942. Authors are responsible for the accuracy of the bibliographic references.

The summary should be a factual and brief recapitulation of the observations or statements contained in the article. The conclusions drawn from the case, experiment, or facts set forth should be clearly stated and should appear at the close.

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Address: U. S. Armed Forces Medical Journal, Bureau of Medicine and Surgery Department of the Navy, Washington 25, D. C.

FREDERIC W. FARRAR, *Editor-in-Chief*

*Captain, Medical Corps*

*United States Army*

WAYNE G. BRANDSTADT, *Associate Editor*

*Colonel, Medical Corps*

*United States Army*

HOMER J. BENTON, *Associate Editor*

*Colonel, Medical Corps*

*United States Air Force.*

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OFFICE OF THE SECRETARY OF DEFENSE  
ARMY MEDICAL POLICY COUNCIL  
WASHINGTON 25

**MILCO- Personnel of the Medical Services of the United States Armed Forces**

The first Military Medical Session of the Scientific Assembly of the American Medical Association will be held in Atlantic City on June 14 and 15. At this time the first officers of the new Military Medical Session will be elected.

The efforts of the delegates from the three military services during the past several years in cooperation with the American Medical Association to establish such a Military Medical Session, to better inform their civilian confreres in the medical profession of military affairs, has been fulfilled. This new Military Medical Session will be the medium through which each medical officer may find professional enlightenment for the benefit of our nation, its defenses and his own scientific advancement.

Thus, in the 104th year of the American Medical Association, by the establishment of this Session, full recognition will be given to the professional medical problems so vital to the defenses of our nation. The professional and scientific understanding of the military and civilian medical men of our country is now contemplated on the forum floor of the scientific assembly of the American Medical Association.

I know that all physicians can and will want to support and participate in this new Military Medical Session.

*Richard L. M-ling*  
Richard L. M-ling M. D.  
Chairman

# UNITED STATES ARMED FORCES MEDICAL JOURNAL

Volume II

May 1951

Number 5

## Symposium on Amyloidosis<sup>(1)</sup>

### I INTRODUCTION

David J. Cracovener *Captain, MC, U S N*

**A**MYLOIDOSIS is a disease in which a foreign protein amyloid is produced and deposited in certain tissues. In the past year we have had seven cases of amyloidosis (all fatal) in this hospital. In none was the clinical diagnosis of amyloid disease established though it was suspected in two of the cases. It is rather difficult to recognize amyloidosis as a clinical entity because there are no characteristic symptoms there are however laboratory aids to the diagnosis of amyloidosis. The diagnosis of primary amyloidosis has been established on the basis of biopsies from sites including the skin buccal mucosa skeletal muscles vagina and stomach (2) and in all types of amyloidosis the intravenous Congo red test may be helpful. When positive it is almost pathognomonic of amyloid disease.

In the past the clinician has been prone to consider amyloidosis as essentially a pathologic diagnosis one of those tissue changes to be demonstrated at autopsy or under the microscope but about which little could be done even if recognized ante mortem. This attitude if true in all probability stemmed from the concept that amyloid disease was essentially irreversible. It is now well known however that recovery from secondary amyloidosis may occur usually following the regression of the responsible inflammatory process (3) (4) (5). With the use of antibiotics such recovery may be observed more frequently. Too the work

(1) Presented at the Monthly Staff Conference by the Pathology Department U S Naval Hospital, St. Albans Long Island, N Y 10 May 1949

(2) Selikoff, I. J. and Robitzek, E. H.: Gingival biopsy for diagnosis of generalized amyloidosis. *Am. J. Path.* 23: 1099-1111 Nov. 1947

(3) Roscablatt, M. B.: Recovery from generalized amyloidosis secondary to pulmonary tuberculosis; report of case. *Arch. Int. Med.* 57: 562-565 Mar. 1936

(4) Perlman, A. W.: Regression of amyloidosis. *Quart. Bull. Sea View Hosp.* 6: 92-97 Oct. 1940.

(5) Dick, G. F., and Leiter, L.: Some factors in development, localization and absorption of experimental amyloidosis in rabbit. *Am. J. Path.* 27: 741-754, Sept. 1941

of Grayzel et al. (6)(7) indicates that administration of liver substance both experimentally in mice and clinically in humans has a curative effect on secondary amyloidosis. Although there are probably some differences in the composition of amyloid in the primary and secondary forms of the disease, therapy with liver substance may be found to be of benefit in the primary type also.

---

(6) Grayzel, H. G.; Jacobi, M.; Varrhall, R. B.; Bogin M.; and Belker, H.; Amyloidosis; experimental studies. *Arch. Path.* 37: 50-75, Jan. 1934.

(7) Jacobi, M., and Grayzel, H. Generalized secondary amyloidosis; histo-pathological study of 84 cases. *J. Mt. Sinai Hosp.* 12: 359-363 May-June, 1945.

# Symposium on Amyloidosis<sup>(1)</sup>

## II CLASSIFICATION AND PATHOLOGY OF AMYLOIDOSIS

Samuel H. Rosen M. D. (3)

### CLASSIFICATION

Amyloidosis presents no constant pathologic or clinical picture. This fact is reflected in such varied terminology as primary idiopathic atypical or paramyloidosis, secondary or typical amyloidosis, local or systemic amyloidosis, and tumor-forming amyloidosis. Amyloidosis has been seen in conjunction with, and presumably secondary to, a variety of diseases. Among these are tuberculosis, osteomyelitis, pyelonephritis, lung abscess, bronchiectasis, carcinoma of the lung, carcinoma of the stomach, leukemia, Hodgkin's disease, multiple myeloma, tabes dorsalis, rheumatoid arthritis, thermal burns, cirrhosis of the liver, chronic empyema, malaria, leprosy, dysentery, chronic ulcerative colitis, regional enteritis, rheumatic fever, and diabetes. Thus far, no one has definitely demonstrated a common denominator for the pathogenesis of amyloidosis in this bewildering variety of diseases. Furthermore, in patients with so-called primary amyloidosis, no other recognizable disease process is present. The most generally accepted classification of amyloidosis is that of Reimann, Koucky, and Eklund (9). They postulated 4 groups: primary amyloidosis, secondary amyloidosis, amyloidosis with multiple myeloma, and tumor-forming amyloidosis.

*Secondary amyloidosis* is relatively common. It usually follows such long-standing diseases as tuberculosis or chronic suppuration. It involves solely or predominantly such parenchymatous organs as the liver, spleen, kidneys, and adrenals. Characteristically, the amyloid is deposited in a subendothelial position in the walls of capillaries and arterioles. Typical staining reactions are usually obtained with special stains.

*Primary amyloidosis* is relatively rare; only 63 cases having been reported up to 1948. It is characterized by the absence of a known etiologic factor or disease. It may be localized in the heart, skin, lungs, et cetera, or may be systemic. Mesodermal tissues such as

(1) Civilian Consultant in Pathology.

(9) Reimann, H. A.; Koucky, R. F.; and Eklund, C. M.: Primary amyloidosis limited to tissues of mesodermal origin. *Am. J. Path.* 11: 977-983, Nov. 1935.



smooth and striated muscle and connective tissue of the cardiovascular system, gastrointestinal tract, lungs, skin, et cetera, are characteristically involved. The amyloid tends to be deposited in nodular form. It gives variable staining reactions (absent, pale, or rapidly fading) with the special stains.

*Amyloidosis associated with and presumably secondary to multiple myeloma* usually has a distribution and character similar to the primary form. It has been reported in 41 of 650 cases of multiple myeloma in the literature (10).

*Tumor-forming amyloidosis* is usually similar in character to the primary form and is rare. It is frequently the type seen in multiple myeloma and it is characterized by small or large solitary or multiple amyloid tumors, especially in the larynx, but also in other sites such as tongue, pharynx, trachea, bronchi, nasal septum, eyes, bladder, bone, and subcutaneous tissues (11).

*This classification is far from satisfactory.* There are cases in which the secondary type of amyloid distribution is encountered without an associated disease process and conversely there are cases in which the primary type of amyloid distribution is associated with known disease. Furthermore, there is much overlapping of the distribution and character of primary and secondary amyloidosis in individual cases. Also, while the association of tuberculosis and of chronic suppurative diseases with amyloidosis is of sufficiently high incidence to be considered causally significant, the association of some of the other diseases such as rheumatic fever and arthritis with amyloidosis is so rare as to suggest that the relationship may be only fortuitous (10). Because the fundamental or direct cause of amyloidosis is not known and the associated diseases such as tuberculosis and chronic supuration are apparently only contributory and not necessary factors, it would seem that any attempt at an etiologic classification is bound to be unsatisfactory.

On the other hand, the known differences in anatomic distribution of amyloid seem striking enough to offer a basis for at least a provisional classification until the cause is discovered. Such a classification was suggested in a recent article (10) using the terms typical and atypical amyloidosis introduced by Lubarsch (12) as the basis. In this classification typical amyloidosis include all cases in which the deposition of amyloid occurs in some or all of the usual sites (liver, spleen, kidneys, and adrenals) with little or no amyloid in other organs, and

(10) King, L. S.: Atypical amyloid disease with observations on new all or none for amyloid. *Am. J. Path.* 24: 1095-1115, Sept. 1948.

(11) Kramer, R., and Sam, M. L.: Local tumor-like deposits of amyloid in larynx; report of case with review of literature. *Arch. Otolaryng.* 71: 324-334, Mar. 1955.

(12) Lubarsch, O.: Zur Kenntnis angeborener Amyloidablagerungen. *Vierteljahrsschr. f. path. Anat.* 271: 867-889, 1929.

*atypical amyloidosis* includes all cases in which the usual sites are spared entirely or for the most part although amyloid is deposited extensively in one or many less usual sites. In both groups there may be patients with or without other disease that is those whose condition has been called secondary and primary amyloidosis respectively. Thus such diagnostic designations as typical or atypical amyloidosis with tuberculosis typical or atypical amyloidosis with multiple myeloma (rare) atypical local amyloidosis of the heart lungs or skin atypical systemic amyloidosis atypical amyloidosis with senility (10) and atypical local amyloidosis of the islets of Langerhans in diabetes might be used.

### PATHOLOGY

In textbooks of pathology amyloidosis is classed as a degenerative process along with fatty degeneration hyaline degeneration et cetera but just as fatty degeneration is believed to be in some instances at least an infiltration rather than a true degeneration, so it is generally believed that amyloidosis is an infiltration rather than a true degenerative process. As to the origin of amyloid or its mode of deposition, we have even less definite knowledge than we have about its chemical nature. The old view that amyloid is a compound of protein and chondroitin-sulfuric acid has been generally abandoned. Present evidence indicates that it is principally protein in character that it has a sulfate-bearing polysaccharide fraction, and that it is a product of variable chemical composition comprising a group of closely related substances (13) (14). Of the many theories regarding the pathogenesis of amyloidosis the view that it involves fundamentally an immune mechanism, which may not be apparent and is possibly of an allergic nature and that it entails a disturbance of the serum protein and a reaction between some component of the serum globulin and certain fixed tissue elements seem to have much in its favor from both a clinical and experimental standpoint (14) (15) (16).

A fundamental feature of amyloid degeneration is that the substance is seen not within cells but in the intercellular tissues. It then damages the parenchyma in two essential ways. When sufficient amyloid has accumulated it compresses adjacent parenchymal cells and causes pressure atrophy and necrosis. This is best seen in the liver and adrenals. Or if amyloid accumulates in the walls of blood vessels in

(13) Hass, G. M.: Studies of amyloid; isolation of polysaccharide from amyloid-bearing tissues. *Arch. Path.* 34: 92-105, July 1942.

(14) Hass, G. M.; Huntington, R. and Kramdieck, N.: Amyloid, properties of amyloid deposits occurring in several species under diverse conditions. *Arch. Path.* 35: 226-241, Feb. 1943.

(15) Ekland, C. M. and Reiman, H. A.: Etiology of amyloid disease with note on experimental renal amyloidosis. *Arch. Path.* 21: 1-9, Jan. 1936.

(16) Kolesky, S., and Stecher, E. M.: Primary systemic amyloidosis: involvement of cardiac valves, joints and bones, with pathologic fracture of femur. *Arch. Path.* 27: 267-288, Feb. 1939.

an amount sufficient to narrow the lumens the resulting decrease in nutrition causes fatty and hyaline droplet degeneration of the parenchyma as well as atrophy or necrosis. This process is best exemplified in the kidneys where it has led to the designation *amyloid nephrosis*.

Grossly organs involved in amyloidosis may show little or no increase in size or alteration of architecture when the amyloid deposit is slight or they may show marked increase in size and alteration of appearance when the amount of amyloid is large. In the latter case the organs assume a peculiar waxy firmness and more or less pallor the pallor being caused in part by a decrease in blood supply and in part by amyloid replacement of the parenchyma. The cut surface presents a spotty or more diffuse smooth translucency depending on the degree of amyloid involvement and the organ involved. By applying Lugol's solution directly to the fresh tissues the gross diagnosis can frequently be confirmed (fig. 1). The translucent amyloid foci take the iodine stain and appear mahogany brown. If now dilute sulfuric acid is applied, the color may deepen to a blue-black. It was the latter reaction that led Virchow to believe that the substance was a starchlike carbohydrate and so to give it the name amyloid meaning starchlike.



Figure 1—Longitudinal section of liver and cross section of spleen, each treated at one end with Lugol's solution and dilute sulfuric acid, illustrating positive tests for amyloid. In the spleen the dark spots indicate malpighian corpuscles replaced by amyloid (sago spleen). In the liver the dark tracery indicates amyloid deposited around bloodvessels.

Microscopically amyloid is a more or less homogeneous hyaline-like substance. With the hematoxylin and eosin (H and E) stain it is indistinguishable from hyaline although it tends to be a paler red. Generally the distribution of the substance permits a diagnosis to be made even with the H and E stain. Special stains however are available for confirmation, which is necessary when only small amounts of amyloid are present or when the amyloid is deposited in unusual sites. These special stains are principally methyl violet and Congo red. Methyl violet stains amyloid violet. Congo red stains it salmon pink.



*Figure 2.—Sago spleen stained with H and E showing replacement of a malpighian corpuscle and central arteriola by amyloid which is being engulfed by numerous foreign-body giant cells at the periphery*

The affinity of amyloid for Congo red is the basis of the intravenous use of the dye as a diagnostic procedure in suspected amyloid disease. In patients dying shortly after the performance of the Congo red test, the amyloid-containing viscera particularly the liver may show the typical salmon-pink stain strikingly. Although amyloid is not ordinarily seen within cells it may act as a foreign body and be phagocytosed by foreign-body giant cells (fig. 2).

The physiologic disturbances caused by amyloidosis and the clinical findings are quite variable. They depend on the amount of amyloid deposited and the organ or organs involved with complications arising from the associated disease process such as tuberculosis, osteomy-

osition there may be no detectable disturbances and it is surprising how little disturbance and how few symptoms may result from extensive involvement of an organ or even of a number of organs. Because amyloid has been seen in practically every organ and tissue in the body including the nervous system, it is not surprising that diseases of every system may be simulated, e. g. carcinoma of the tongue, scleroderma, myotonia, arthritis, neuritis, nephritis, coronary artery disease, valvular heart disease, purpura, carcinoma of the gastrointestinal tract, carcinoma of the lung, carcinoma of the larynx, carcinoma of the urinary tract, beriberi et cetera (16)

# Symposium on Amyloidosis<sup>(1)</sup>

## III SECONDARY (TYPICAL) AMYLOIDOSIS IN QUADRIPLÉGICS

### REPORT OF FOUR CASES

Murdock S. Bowman *Lieutenant, junior grade MC, U S N*

Ernest S. Redfield *Lieutenant, MC, U S N*

Patients with quadriplegia are seen from time to time in most hospitals but institutions having more than one such patient under observation at one time or within a short period of time are limited principally to hospitals of the Armed Services or the Veterans Administration. So far as could be determined from a fairly thorough search of the literature complete reports including autopsies comparing the findings in a group of these patients have not been published (17). This article presents briefly the clinical and autopsy findings in four consecutive cases of quadriplegia in young men who died at this hospital since August 1947 placing emphasis on the consistent finding of chronic suppurative renal disease and amyloidosis which, it is believed, were directly related to each other.

### CASE REPORTS

*Case 1* — A 28-year-old white man suffered a compression fracture of the body of the fifth cervical vertebra after a fall from a 125 foot cliff. No return of function occurred. The patient developed large decubitus ulcers which did not appear to involve the underlying bone. A periurethral abscess developed about 6 weeks after injury and soon after this a persistent upper urinary tract infection with calculi developed. Urine cultures showed *Proteus vulgaris*, *Pseudomonas aeruginosa* and *Escherichia coli* at various times. Uremia was present terminally. The liver was enlarged down to the pelvic brim about 3 weeks before death. Diarrhea also occurred terminally and the patient died 27 months after injury. The pertinent autopsy findings included fracture of the fifth cervical vertebra with compression of the spinal cord, terminal bronchopneumonia, peripheral edema, ascites, hydrothorax, decubitus ulcers, bilateral pyelonephritis and amyloidosis of the liver, spleen, adrenals, kidneys and pancreas.

(17) Since this paper was presented, the following article appeared in the literature: Thompson, C. E., and Rice, M. J., Jr.: Secondary amyloidosis in spinal cord injury. *Ann. Int. Med.* 31: 1057-1065 Dec. 1949.

**Case 2**—A 20-year-old white man suffered dislocation of the sixth and seventh cervical vertebrae in an automobile accident. No return of function occurred. Enlarging decubitus ulcers developed soon after injury. Four months after injury the spleen was enlarged and tender. Upper urinary tract infection was present and persisted with calculus formation. Cystotomy was performed. Urine cultures showed *P. vulgaris*. Proteinuria was first noted about 7 months after injury. Terminally the patient developed uremia and died about 11 months after injury. The pertinent autopsy findings included posterior dislocation of the sixth and seventh cervical vertebrae, terminal bronchopneumonia (microscopic), ascites, peripheral edema, hydrothorax, acute and chronic cystitis, bilateral ureteritis and pyelonephritis with calculi, decubitus ulcers and amyloidosis of the liver, spleen and kidneys.

**Case 3**—A 23-year-old white man fractured and posteriorly dislocated the fifth and sixth cervical vertebrae when he dived into the surf. Only slight recovery of function of the upper extremities occurred. Right renal and urinary bladder calculi were first noted roentgenologically 7 months after injury. Upper urinary tract infection was present almost continuously thereafter and the urine cultures showed *E. coli* and *P. vulgaris*. Proteinuria began concomitantly. Suprapubic cystotomy was performed 16 months after injury but infection of the upper urinary tract persisted. Uremia and peripheral edema were noted about 1 month prior to death, which occurred about 18 months after injury. The pertinent autopsy findings included fracture-dislocation of the fifth and sixth cervical vertebrae with compression of the spinal cord, peripheral edema, light peritoneal effusion, decubitus ulcers, terminal bronchopneumonia (seen only in the microscopic sections), chronic active ulcers of the stomach and duodenum, chronic cystitis, bilateral ureteritis and pyelonephritis with calculi in the right kidney and amyloidosis of the liver, spleen, adrenals, kidneys, arteriole of the pancreas and mucosa of the stomach and small intestine.

**Case 4**—An 18-year-old white man, had an acute back pain followed by the rapid onset of quadriplegia. A tentative diagnosis of spinal arterial thrombosis was made. Decubitus ulcers and upper urinary tract infection developed within 2 months of the onset of quadriplegia. Urine cultures showed *P. vulgaris* and *Ps. aeruginosa*. Proteinuria occurred concomitantly but subsided, and became persistent only after 15 months of illness. An episode of icterus diagnosed as infectious hepatitis which was thought to have resulted from transfusions of whole blood occurred after 5 months. Uremia was first noted after 11 months and in spite of slight gradual return of sensory and motor function, the patient died after 18 months of illness. The pertinent autopsy findings included lesions in the brain and spinal cord suggesting encephalitis lethargica and atypical poliomyelitis, terminal bronchopneumonia, a large decubitus ulcer of the sacrum, chronic cystitis, bilateral ureteritis and pyelonephrosis with calculi, perforation of the lower pole of the right kidney with perinephric abscess and

acute generalized fibrinopurulent peritonitis and amyloidosis of the liver spleen, adrenals kidneys and small and large intestines

### DISCUSSION

The autopsy findings in the four cases are compared in table 1. Grossly the amyloid took a mahogany brown stain with Lugol's solution in all locations and in microscopic preparations it stained typically in

TABLE 1 — Comparison of autopsy findings in 4 cases of secondary amyloidosis

	Case 1	Case 2	Case 3	Case 4
Age + time of injury (years)	28_____	20_____	23_____	18_____
Duration of illness (months)	27_____	11_____	18_____	18_____
Peripheral edema	Slight_____	Marked_____	Marked_____	None
Ascites	Moderate_____	Moderate_____	Slight_____	Slight (associated fibrinopurulent peritonitis)
Hydrothorax	Moderate_____	Marked_____	Negligible_____	None
Decubitus ulcers	Large_____	Large_____	Large_____	Large (possible involvement of sacral bone)
Pyelonephritis	Marked_____	Marked_____	Marked_____	Marked
Organs containing amyloid				
Liver	Marked_____	Slight_____	Slight_____	Moderate
Spleen	Marked_____	Moderate_____	Marked_____	Moderate
Adrenals	Moderate_____	Not examined	Slight_____	Slight
Kidneys	Moderate_____	Slight_____	Slight_____	Slight
Other	Slight (pancreas)_____	None_____	Slight (gastrointestinal tract and pancreas)_____	Slight (intestinal tract)

all sites with Congo red and methyl violet. The liver was enlarged in all four cases usually about one and one-half times normal weight, except in case 2 in which only slight enlargement was present. Grossly amyloid in the liver was only suspected from a vague waxiness. Lugol's solution gave a mahogany brown tracery most marked in





Figure 6.—Case 3 Section of the pancreas stained with Congo red showing amyloid in the arterioles.



Figure 7.—Case 4 Section of the colonic mucosa stained with Congo red showing amyloid around capillaries at surface (broad dark line and circles).

Amyloid deposition in case 1 was seen in arterioles in the pancreas as well as in an occasional islet and duct wall. In case 3 it was also seen in arterioles of the pancreas (fig. 6) as well as in the mucosa of the stomach and small intestine. It was also seen in the mucosa of the small intestine and colon in case 4 (fig. 7). The skin was not examined in cases 2, 3 and 4 but no amyloid was seen here in case 1.

#### COMMENT

These cases have been presented principally as examples of secondary amyloidosis as well as to point out the possible high incidence of this condition in quadriplegic patients. The disease which presumably caused the amyloidosis was in all cases a chronic suppurative process, pyelonephritis with decubitus ulcers possibly contributing an added factor. Although pyelonephritis is not one of the more common diseases associated with amyloidosis this association has been noted frequently in the literature. Most cases of pyelonephritis are not of sufficiently long duration to cause amyloidosis. The patient is either cured by medical means if the disease is not too severe or if it is severe and unilateral by operation. In quadriplegics however conditions are favorable for the occurrence of intractable chronic urinary tract infection, as well as decubitus ulcers because with modern methods of therapy these patients may be kept alive for relatively long periods. This prolonged combination of infection and debility may account for the high incidence of amyloidosis in quadriplegics.

The amyloid involvement of the liver, spleen, kidneys and adrenals in all four cases is the usual finding in secondary or typical amyloidosis. The fact that in three of these cases the pancreas and/or the gastrointestinal tract were also slightly involved illustrates the tendency for overlapping of the primary (atypical) and secondary (typical) types of distribution. The staining reactions of the amyloid with iodine, methyl violet and Congo red were in all instances also typical of those seen with secondary amyloidosis. The ulcers of the stomach and duodenum in case 3 may have been secondary to the amyloid involvement of the mucosa although the possibility of their being ordinary peptic ulcers cannot be excluded. Gastrointestinal ulcers caused by amyloid have been reported (12).

It is believed that the episode of jaundice in case 4 was a manifestation of infectious hepatitis which was probably caused by whole blood transfusions. Jaundice is rarely caused by amyloidosis of the liver even when the liver involvement is marked (18). The clinical findings including the uremia and death of all of the patients is largely attributable to the chronic urinary tract infection. The amyloidosis was on the whole of only a slight to moderate degree and probably only served as a contributory factor as is commonly the case. From a

(18) Oeloff J., and Falder L.: Primary systemic amyloidosis; jaundice as rare complication. *Am. J. M. Sc.* 212:275-279, Sept. 1946.

therapeutic standpoint, liver therapy directed toward reversal or prevention of the amyloidosis might prolong the life of these patients by protecting those organs concerned with natural resistance to infection, that is the spleen liver and adrenal glands (7).

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# Symposium on Amyloidosis<sup>(1)</sup>

## IV PRIMARY (ATYPICAL) LOCALIZED AMYLOIDOSIS OF HEART

### CASE REPORT

James M. Smith, *Lieutenant Commander MC, U S N*

**Case 5**—A 36-year-old white man was admitted to this hospital with a diagnosis of lobar pneumonia. He had been well until 10 days prior to admission, when he developed progressively symptoms and signs compatible with the admission diagnosis. Physical examination, laboratory tests and roentgenograms of the chest confirmed the diagnosis. Questionable heart disease was mentioned in the past history. The exact details were not recorded. There were roentgenographic evidences of cardiac hypertrophy and electrocardiographic changes and clinical signs of congestive heart failure. The patient was treated with penicillin for the pneumonia and with digitalis derivatives for the heart failure. The response to therapy was gradual, but definite and by the nineteenth hospital day clinical improvement was sufficient to permit toilet privileges. On the thirty-third hospital day the patient again suddenly developed congestive heart failure. Digitalis therapy again produced symptomatic improvement but on the forty-third hospital day signs and symptoms of congestive heart failure returned and the patient died suddenly on the forty-eighth hospital day. Clinical impressions at the time of death included rheumatic or virus pneumonia, rheumatic or virus myocarditis, old pulmonary infarcts and terminal pulmonary embolism.

The autopsy findings were not striking. Chronic passive congestion of the viscera, pulmonary edema, bilateral slight pleural effusion (about 200 cc. on each side), slight pericardial effusion (about 200 cc.) and slight ascites (about 250 cc.) were observed. The heart was almost twice the normal size and weighed 550 grams. The hypertrophy was moderate but the dilatation of all chambers was marked. The myocardium was pale in color and rubbery in consistency; it did not, however, have the firm waxy consistency typical of advanced amyloidosis of the heart. On sectioning, white to yellow foci from 1 to 2 mm. in diameter were encountered. The coronary vessels and valve leaflets were normal. The gross test for amyloid with Lugol's solution was negative. Histologically, with the H and E stain, amorphous pink-staining material was seen in small irregular areas replacing muscle fibers as well as focally

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between muscle fibers using compr  
ally surrounding the vessels (Fig  
methyl violet.) Although this mater  
reaction for amyloid with methyl  
is considered an instance of primary  
of the well known variability and  
primary amyloidosis and because the  
distribution of the material were compar  
total myocardial involvement appeared  
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Figure 2.—Case 3. Serial  
show amyloid

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heart (19) The present case falls in the first class The greatest number of cases however falls in the second class

Wessler and Freedberg (20) in a review of the literature and of the case records of 4 Bostonian hospitals recorded a total of 64 cases of cardiac amyloidosis of unknown origin. In a series of 22 unselected cases of primary amyloidosis of the heart the average age at death was 57 years (range 36 to 80) The sex distribution was equal King (10) recently reported 5 patients (3 male and 2 female) with primary amyloidosis of the heart and congestive heart failure associated with senility The ages in this series varied from 83 to 93 years and the cardiac amyloidosis was an incidental postmortem finding Contrary to a former belief primary amyloidosis occurs in Negroes but less frequently than in white persons (21) The relative incidence of primary amyloidosis is indicated by the report of Dillon and Evans (22) that out of 4 551 autopsies at the Peter Bent Brigham Hospital from 1913 to 1941 there were 23 cases of proved amyloid disease of which only 3 were primary

The average duration of life in primary systemic amyloidosis is about 2½ years although one case of 14 years duration is on record (16) Congestive heart failure caused by myocardial involvement was considered the cause of death in about 50 percent of these cases Although recovery from secondary amyloidosis has been reported (3) (4) (7) Dillon and Evans (22) were unable to find any mention of recovery from primary amyloidosis in the literature

The correct clinical diagnosis of primary systemic amyloidosis is seldom made According to Ballinger (23) the diagnosis was made in only 8 of 46 cases examined postmortem and reported in the literature The clinical diagnosis in the case presented here was complicated by the fact that the history and presenting signs and symptoms were typical of pneumonia We may surmise that this patient with primary amyloidosis of the heart had a narrow margin of cardiac reserve and that with the intercurrent pneumonia this margin was lost The penicillin cured the pneumonia but the recurring congestive heart failure did not completely respond to digitalization.

The most constant clinical feature observed in amyloidosis of the heart is intractable congestive heart failure which was the outstanding feature of the present case This is directly related to the amyloid

(19) Budd, J. W. Primary amyloid disease of heart report of case. *Am. J. Path.* 10: 295-308 Mar. 1934

(20) Wessler, S., and Freedberg, A. S.: Cardiac amyloidosis; electrocardiographic and pathologic observations. *Arch. Int. Med.* 82: 63-74 July 1948.

(21) Pearson, B. Ric. M. M., and Dickens, K. L.: Primary systemic amyloidosis report of 2 cases in Negroes with special reference to certain histologic criteria for diagnosis. *Arch. Path.* 32: 1-10, July 1941

(22) Dillon, J. A., and Evans, L. R.: Primary amyloidosis report of 3 cases. *Ann. Int. Med.* 17: 722-731 Oct. 1942.

(23) Ballinger, J.: Amyloid heart disease. *Am. J. Med. Sc.* 217: 308-313 Mar. 1949



present in the heart. In some instances in addition to the myocardial deposits which cause atrophy and replacement of muscle fibers coronary vessel walls and valve leaflets are infiltrated with amyloid to such a degree that coronary insufficiency and rheumatic valvulitis are simulated and erroneously diagnosed (16) (22)

The electrocardiographic findings in primary amyloidosis of the heart vary and are not diagnostic; they may be indistinguishable from those seen in cases of myocardial infarction. They usually include one or more of the following: prolonged P-R and QRS intervals; low voltage; deep Q waves; and variations in T waves (20). In the case presented repeated electrocardiograms listed P-R intervals at the upper limits of normal; low voltage; and altered T waves. The heart is usually slightly to moderately enlarged, as in the present case, but it may show no enlargement or fairly marked enlargement. A fairly frequent (though perhaps over-rated) (24) clinical finding of diagnostic value in the systemic type of primary amyloidosis is an associated macroglossia. As the diagnosis of primary amyloidosis was not considered at autopsy, it is not known definitely in this case whether there were any amyloid deposits in the tongue. No appreciable enlargement of the tongue was noted clinically or at autopsy.

In conclusion it may be emphasized that primary amyloidosis of the heart should be considered in all cases presenting the features of intractable congestive heart failure, moderate cardiac hypertrophy, definite but nonspecific electrocardiographic changes, and the absence of history of hypertension, arteriosclerosis, or valvular heart disease. Although it is an uncommon disease, the late Soma Weiss (25) considered primary amyloidosis of the heart important enough to be considered in the differential diagnosis in all cases of clinically bizarre heart disease.

(24) Dahlin D. C.: Primary amyloidosis with report of six cases. *Am. J. Path.* 25: 105-123, Jan. 1949.

(25) Weiss, S. (Boston): Disease of heart and arm which is not well recognized. *M. Clin. North America* 23: 1323-1344, Sept. 1939.

# Symposium on Amyloidosis<sup>(1)</sup>

## V ATYPICAL AMYLOIDOSIS IN MULTIPLE MYELOMA

### CASE REPORT

Francis J. McMahon, *Lieutenant Commander MC, U S N*

The occurrence of atypical and occasionally typical amyloidosis in multiple myeloma is well recognized. Magnus Levy (26) reported the presence of amyloid chiefly in muscles and joints in 35 of 150 cases of multiple myeloma examined postmortem an incidence of 24 percent. Atkinson (27) collected 643 recorded cases of multiple myeloma in 1937 and found amyloid reported in 40 an incidence of 7 percent. The distribution in these 40 cases was both typical and atypical involving practically every organ and system of the body including the myeloma foci. Tarr and Ferris (28) reported 1 case and collected 11 others from the literature in which the predominant amyloid deposits were in the form of tumor nodules located in the muscles and about the joints and being absent for the most part from the typical sites or if present there showing atypical staining reactions. The present article deals with a case of multiple myeloma associated with atypical amyloidosis the amyloid being confined to the tumor foci and the kidneys.

### CASE REPORT

**Case 6**—A 52 year-old white man complained of low back pain of 5 months duration which gradually increased in severity radiating down both legs to the knees and being aggravated by lying down. Following a spinal puncture he became paraplegic. A laminectomy was performed revealing a tumor mass surrounding and compressing the cord at the level of the eleventh thoracic vertebra and apparently arising in the vertebral body. The biopsy led to a diagnosis of plasma cell myeloma. myeloma cells were also noted in a smear from the sternal marrow. Roentgenograms of the bony skeleton revealed round osteolytic lesions in the skull pelvis ribs vertebrae and femurs that in time increased

(26) Magnus-Levy A.: Multiple Myelom. *Englobulinkmai. Zur Klinik und Pathologie Amyloidosis. Ztschr f. Klin. Med.* 126: 62-111 1933.

(27) Atkinson, F. R. B.: Multiple myelomata. *M. Pres.* 1937: 312 Oct. 6 1937; 327 Oct. 13 1937.

(28) Tarr L., and Ferris H. W.: Multiple myeloma associated with nodular deposits of amyloid in muscles and joints and with Deane Jones proteinuria. *Arch. Int. Med.* 64: 820-833 Oct. 1939.

in size and number. Twelve months following the onset of this illness hypertension with symptoms developed, the systolic pressures rising from 156 to 190 and the diastolic from 88 to 110. The patient was treated with stilbamidine which controlled the pain. Anemia developed and the patient died in uremia complicated by bronchopneumonia 13 months after the onset of his illness.

Bence-Jones proteinuria was observed once during the last 3 months of the illness and 4 plus persistent albuminuria was also observed within the same period. The nonprotein nitrogen, which was normal on admission, rose to 346 mg per 100 cc on the day of death. The Congo red test performed early in the disease was negative. There was no hypercalcemia but the blood phosphorus rose to 8.3 mg per 100 cc and alkaline phosphatase rose to 7.3 Bodansky units.

The principal autopsy findings were multiple myeloma, myelomatous nephrosis, amyloidosis of myelomatous foci and of the kidneys, slight hypertrophy and dilatation of the heart; and confluent bronchopneumonia of the right lung.

The vertebrae, sternum, ribs and calvarium showed irregular foci of destruction from a few millimeters to 1 centimeter or more filled with soft red gray tumor tissue. The tumor had invaded the paravertebral soft tissues and encroached on and compressed the spinal cord. Lugol's solution brought out mahogany brown spots and streaks in the tumor. Microscopically with the H and E stain these areas were seen to be composed of a rather pale pink-staining homogeneous amyloid material.



Figure 9—Ca 6. Section of a vertebra stained with Congo red showing irregular masses of amyloid within an area of plasma cell myeloma being engulfed by foreign-body giant cells.

occurring in masses and strands within the plasma cell myeloma. Figure 9 shows a section stained with Congo red. The tumor was a typical plasma cell myeloma crowding out normal hematopoietic marrow and destroying bony trabeculas. The kidneys weighed 210 and 225 grams being slightly enlarged, pale and yellow-brown. Many prominent opaque yellow streaks were noted in the cortico-medullary region. On application of Lugol's solution these appeared as mahogany brown streaks. Microscopically the kidneys presented the findings of myelomatous nephrosis with atypical amyloidosis. In the cortico-medullary region the H and E stain brought out irregular linear



Figure 10—Case 6. Section of the cortico-medullary region of the kidney stained with methyl violet showing linear deposits of amyloid between tubules, compression and degeneration of tubules, and dense casts in distended tubules.

deposits of pale pink-staining material in the stroma. These were interpreted as amyloid causing compression atrophy of some of the tubules (Figure 10 shows a section stained with methyl violet.) Many other tubules were distended with dense pink and blue staining casts and showed marked degenerative changes. Many of the casts were surrounded by multinucleated cell masses resembling foreign-body giant cells (fig. 11) as in the case reported by Tarr and Ferris (28). These casts were probably composed of Bence-Jones or other abnormal protein but some of them may have been amyloid. The amyloid did not show the typical staining reaction with Congo red or methyl violet either in the kidneys or in the tumor. The glomeruli appeared normal except for dilatation of the capsular spaces apparently due to tubular obstruction by the numerous casts (fig. 11). There was a diffuse increase in connective tissue stroma with marked infiltration of small round cells.



Figure 11—Case 6. Section of the cortical region of the kidney showing myelomatous nephrosis. Note tubule distended with cast surrounded by multinucleated cell masses resembling foreign-body giant cells, distention of glomerular capsular spaces, and increase in connective tissue stroma with small round cell infiltration. Unlike the usual amyloid kidney (cf. fig. 14) the glomeruli here contain no amyloid, which is present only in the stroma (cf. fig. 10).

### COMMENT

The case presented illustrates the occurrence of amyloidosis in multiple myeloma. The amyloidosis was of the localized atypical type occurring only in the tumor and kidneys. It was atypical not only in distribution but also in character in that it was deposited in masses and gave atypical staining reactions with Congo red and methyl violet. This is the type of amyloidosis that is most often seen with multiple myeloma (7). In the kidney itself the distribution was also atypical because the glomeruli and arterioles were spared (fig. 11) and the amyloid was deposited solely in the connective tissue stroma between the tubules (fig. 10).

In both the tumor and the kidneys the amount of amyloid was so small and its distribution of such a nature that none of the patient's symptoms could be attributed to it. The renal insufficiency is explained on the basis of so-called myelomatous nephrosis rather than amyloid nephrosis. The hypertension may also be attributed to the myelomatous nephrosis. This however is an unusual feature as the blood pressure is almost always normal in myelomatous nephrosis. The same is also true of myeloid nephrosis (29) (30). The small amount of amyloid found in

(29) Dixon, H. M.: Renal amyloidosis in relation to renal insufficiency. *Am. J. M. Sc.* 187:471-411 Mar. 1934.

(30) Pearline, A. W.: Amyloidosis: Clinical and pathological study of 135 cases. *Quart. Bull. New York Hosp.* 6: 293-308 Apr. 1941.

autopsy is also consistent with the negative Congo red test obtained during life since this test is usually negative unless there is marked amyloid deposition in the body (31)

In the early part of the patient's illness his pain was thought to be arthritic. This is of interest because according to Tarr and Ferris (28) amyloid deposits in multiple myeloma may produce arthritic symptoms and signs especially of the rheumatoid type. In the present case however the pain was caused by the myelomatous involvement of the vertebrae.

The relationship of hyperproteinemia especially hyperglobulinemia and other abnormal protein fractions to amyloidosis in multiple myeloma has received much attention (32). Patients with multiple myeloma as well as certain other conditions associated with amyloidosis are known to have long periods of hyperglobulinemia. Magnus Levy (33) and others (28) who observed that some of the tubular casts in myelomatous kidneys stained like amyloid suggested that increased serum proteins whether Bence-Jones protein globulin, or other abnormal protein fraction, served as the precursor of amyloid.

The incidence of amyloidosis in multiple myeloma is fairly high. This should lead one to consider the possibility of amyloidosis in every patient with multiple myeloma and of multiple myeloma in every patient with atypical amyloidosis.

(31) S. Zimmerman, M. G., and Auerbach, O.: Value and limitations of Congo red test for amyloidosis. *Am. J. M. Sc.* 208: 305-309, Sept. 1944.

(32) Gutman, A. B., and others: Fractionation of serum proteins in hyperproteinemia with special reference to multiple myeloma. *J. Clin. Investigation* 20: 765-783, Nov. 1941.

(33) Magnus Levy, A.: Bence-Jones Eiweis and Amyloid. *Ztschr. f. klin. Med.* 116: 510-531, 1931.



# Symposium on Amyloidosis<sup>(1)</sup>

## VL AMYLOIDOSIS OF MIXED PRIMARY (ATYPICAL) AND SECONDARY (TYPICAL) TYPES WITH RENAL INSUFFICIENCY IN A CASE OF CHRONIC PULMONARY TUBERCULOSIS

Ernest S. Redfield, *Lieutenant, MC U. S. N*

Amyloidosis is most frequently seen in association with chronic pulmonary tuberculosis some writers stating the incidence to be as high as 40 percent (30). The distribution of the amyloid is usually of the secondary (typical) type that is principally or solely in the liver spleen adrenal glands and kidneys. The following case is of interest in that it illustrates the relatively uncommon combination of primary (atypical) and secondary types of amyloid distribution and the occurrence of renal and possibly adrenal insufficiency caused by large deposits of amyloid in the kidneys and adrenal glands in a patient with chronic pulmonary tuberculosis.

### CASE REPORT

*Case 7* —A 59-year-old white man had a history of pulmonary tuberculosis of a little over 10 years' duration at the time of death. The course was slow but progressive. New lesions appeared first in one lung and then in the other with partial healing of some of the lesions during periods of bed rest. Thoracoplasty was performed for a cavity in the left lung about 2½ years after the lesions were first observed in the roentgenograms. The sputum became persistently positive after 6 years of illness. After 7½ years a cavity appeared in the right lung and the patient was permanently hospitalized thereafter. Marked proteinuria was first noted in the ninth year of illness and edema of the lower extremities occurred a few months later. Blood pressure remained within normal limits and an electrocardiogram was negative. The Congo red test was strongly suggestive of amyloidosis by an 85 percent retention of dye. The serum proteins fell to low levels and remained reduced in spite of frequent administration of serum albumin intravenously. Chronic gastrointestinal complaints developed about 6 months before death. A gastrointestinal series was within normal limits, however. Spells of profound weakness also began about this time. The blood nonprotein nitrogen level became elevated about 1 year before death and increased rapidly during the last few months of life.



At autopsy no peripheral edema or serous effusions were found. Grossly the lungs contained relatively few tuberculous changes. There were several small encapsulated caseous foci in both lobes of the left lung. A 2.5 cm cavity with a caseous lining and few scattered tubercles were present in the upper lobe of the right lung. The thyroid gland was nodular and moderately enlarged weighing 50 grams. The heart showed moderate hypertrophy and dilatation of the right ventricle such as is frequently seen in chronic pulmonary disease. It weighed 420 grams. The spleen was slightly enlarged and the firm dark red pulp was speckled with pinhead-sized translucent red-gray elevations which stained mahogany brown with Lugol's solution. It was a typical splenic spleen. The liver was grossly normal and the test for amyloid with Lugol's solution was equivocal. The adrenal glands were enlarged and weighed about 14 grams each (normal 6 grams). The cortices stained an almost homogeneous mahogany brown with Lugol's solution. The kidneys were moderately enlarged and pale with small waxy areas in the parenchyma which stained mahogany brown with Lugol's solution.

Microscopically tuberculosis was found only in the lungs. Here old active foci as well as recent caseous tuberculous pneumonia were seen. Amyloid was found to be more widely distributed than was suspected from the gross examination. The thyroid gland showed extensive separation and compression of the follicles by amyloid in the stroma (fig. 12).



Figure 12.—Case 7. Section of the thyroid gland stained with Congo red showing amyloid deposition in the stroma with separation and some compression of the follicles.

This appeared to account for the increase in size of this gland. The heart showed small deposits of amyloid in the stroma of all layers as well as in the walls of small blood vessels (fig 13). The spleen showed marked amyloid deposition in the malpighian corpuscles and also under the sinus endothelium. Abdominal and pulmonary lymph nodes showed amyloid deposits about the small blood vessels. The liver did not show the usual deposition of amyloid along the sinusoids but this substance was present in the walls of the small blood vessels. This type of involvement was seen also in the lungs which in addition, had small deposits in some alveolar septa and in the pancreas intestines and



*Figure 13 —Case 7 Section of the myocardium stained with Congo red showing slight deposition of amyloid between muscle fibers, in the wall of a small artery and in the perivascular stroma.*

testes. The kidney glomeruli and arterioles were extensively and diffusely amyloidotic (fig 14). Amyloid was also deposited around the tubules causing pressure atrophy. The tubular epithelium had degenerated and many tubules were dilated and contained casts, neutrophils and tissue detritus in their lumens. Some increase in connective tissue stroma with small round cell infiltration was also seen. The adrenal cortices were almost entirely replaced by amyloid (fig 15). The medullary tissue was fairly well preserved. Methyl violet and Congo red stains of some of the above tissues gave typical tinctorial reactions for amyloid.

It is noteworthy that such extreme replacement of the adrenal cortex by amyloid as occurred in this case was not associated with Addison's disease. Only a few cases of Addison's disease caused by adrenal amyloidosis have been reported (37). Symptoms attributable to adrenal cortical insufficiency are encountered with amyloidosis of the adrenals (in this case the episode of profound weakness) but they are usually difficult to separate from similar symptoms which might be caused by the associated tuberculosis. Appropriate laboratory studies might have revealed other findings consistent with adrenal cortical insufficiency. The presence of adrenal cortical insufficiency should be suspected in all patients with generalized amyloidosis and appropriate therapy should be instituted, particularly when a major operation is contemplated (38).

The marked amyloid enlargement of the thyroid in this case was not associated with symptoms of hypothyroidism. This is usually the case (39). The fact that the Congo red test on 2 occasions was not unequivocally positive is not unusual as this occurs commonly when the liver the largest storehouse of amyloid is not involved or at most only slightly involved (31).

(37) Schemmmer, M. G., and Amerbach, O.: Adrenal amyloidosis. *Arch. Int. Med.* 74: 384-389 Nov. 1944.

(38) Orsutele, E. A.: Adreno-cortical insufficiency in amyloid disease; preliminary report. *Quart. Bull. Sea View Hosp.* 5: 21-26, Oct. 1939.

(39) Haxner, W. C., and Sanbrook, D. B.: Gross enlargement of thyroid gland due to amyloidosis. *Arch. Surg.* 20: 762-766, May 1930.

# Symposium on Amyloidosis<sup>(1)</sup>

## VII CLINICAL CONSIDERATIONS AND TREATMENT OF AMYLOIDOSIS

Milton B. Rosenblatt, M. D. (40)

Despite the many pathologic and clinical reports in the literature amyloidosis is encountered infrequently in the average hospital. It is only in the special institutions that it is possible to study a large series of cases. The present low incidence of the disease as compared with its common occurrence in the past century has been attributed to surgical and antibiotic progress in the eradication of suppurative foci. At the Montefiore Hospital for Chronic Diseases the type of case admitted made it possible to study a fairly large series (41). Of 1 727 consecutive necropsies the incidence of amyloidosis was found to be 7.2 percent. Further analysis revealed that tuberculosis was by far the greatest etiologic factor. There were 1 276 nontuberculous cases with an amyloid incidence of 1.2 percent and 451 tuberculous cases with an amyloid incidence of 24.4 percent. In the tuberculous patients with suppurative lesions such as empyema and draining bone sinuses the amyloid incidence was 35.2 percent. Similar statistics were reported by Saleeby (42), Waldenström (43), Fishberg (44) and others.

Although amyloidosis has been reported in every decade of life it is essentially a disease of young adults inasmuch as tuberculosis occurs mainly in this age group. It is practically impossible accurately to determine the time required for the development of amyloid disease. Most authors report the onset of clinical amyloidosis within from 1 to 2 years after the appearance of suppuration. At the Montefiore Hospital many patients with pulmonary tuberculosis were observed in which the

(40) Montefiore Hospital for Chronic Diseases, New York, N. Y.

(41) Rosenblatt, M. B. Amyloidosis and amyloid nephrosis. *Am. J. Med. Sc.* 186: 558-567 Oct. 1933.

(42) Saleeby, E. R. Question of existence of amyloid casts. *J. A. M. A.* 84: 344-345, Jan. 31, 1925.

(43) Waldenström, H. Om Amyloid. *Uppköst och Förevisande hos Barn.* Nord. Med. Tidskr. 2: 353, 1930.

(44) Fishberg, A. M. *Pulmonary Tuberculosis*, 4th edition. Lea & Febiger, Philadelphia, Pa., 1932. p. 222.

clinical history of the disease did not exceed 2 years and in which extensive amyloidosis was present. It is unusual for amyloidosis to develop when the associated disease process is of less than 1 year's duration but exceptions have been reported (29) (45) (46).

Almost every tissue of the body may be involved in amyloid degeneration but the organs most frequently involved are the spleen, kidneys, liver and adrenals. Most of the clinical features of amyloid disease depend on the degree of degeneration of these organs. Amyloidosis of the heart will produce myocardial insufficiency but this condition is usually associated with primary amyloidosis which is not included in this discussion. In making a clinical diagnosis of amyloidosis we are dependent on the physiologic abnormalities produced by the pathologic changes in the organs involved. Constitutional symptoms such as pallor, anemia and weakness are so interwoven with the underlying disease that it is inadvisable to consider them of diagnostic value. A waxy facies is not a universal finding and its absence is unimportant. The clinical features of each case depend on the organs involved and the degree of involvement. This is why so many patients show no clinical manifestations and the diagnosis is made only on postmortem examination.

The introduction of the Congo red test by Benshold (47) aroused great deal of clinical interest in the diagnosis of amyloidosis. The favorable results originally reported were confirmed by many other observers. The escape of some of the dye in the urine was originally thought to be a limitation of the test but subsequent studies by Barker and Snell (48) and Rudolph (49) have shown that the amount of dye which escapes in the urine is never large enough to affect the interpretation of the test. In the last few decades certain modifications in the interpretation and technique of the test have been developed. The tendency is now to require at least a 75 percent retention of the dye before making a positive diagnosis. Some investigators insist on practically 100 percent retention. A progressive increase in retention when the test is repeated in the same patient over a period of months is an important finding. A negative Congo red test does not exclude the diagnosis of amyloidosis.

Several refinements in the technique have been added to insure greater accuracy of the test. Probably the most important has been the withdrawal of the first specimen of blood very quickly after the injection

(45) F. Gay C. The Principles and Practice of Medicine, Vol. 2 P. Blakiston Sons and Co. Philadelphia Pa. 1936 p. 487.

(46) Case 2 in Section III of this symposium.

(47) Benshold, H. Über die Ausscheidung intravenös verabreichter Kongorot bei den verschiedenen Erkrankungsstadien in besondere bei Amyloidosis. Dents. med. Arch. f. klin. Med. 142: 52-61. Mar. 1923.

(48) Barker N. W. and Snell A. M. Congo-red test with special reference to excretion of the dye in urine. J. Lab. & Clin. Med. 16: 263-270 Dec. 1930.

(49) Rudolph C. A new series of tests and in diagnosis prognosis and therapy Med. J. and Rec. 13: 296 1933.

of the dye. In the original technic the first specimen was withdrawn 4 minutes after injection. In patients with marked amyloid disease a great deal of dye could be absorbed during these first few minutes and hence the first blood specimen could show a concentration of the Congo red which would be representative of a less amount than had been injected (0.25 cc. of 1.5 percent aqueous solution per kilogram of body weight). Accordingly comparison of the second blood specimen (removed 1 hour later) with the first specimen (taken 4 minutes after injection) could indicate erroneously more retention in the blood (less absorption by amyloid deposits) than was actually the case.

In secondary amyloidosis the spleen is involved more often than any other organ. This was found in the series at Montefiore Hospital and reports by Krumphart (50) and Parkes (51) show similar findings. Despite the universality of splenic involvement however we cannot make too much use of this fact as a diagnostic aid. Our knowledge of the functions of the spleen is limited and there are few procedures available to test splenic insufficiency. When the spleen is greatly enlarged the patient is aware of a mass in the abdomen but as most patients are bedridden because of the underlying disease the splenomegaly produces few mechanical symptoms. The amyloid spleen is hard and nontender and the patient is usually unaware of its presence.

The liver is involved in about 60 percent of the patients with amyloidosis. It is usually palpable as a firm smooth nontender mass. Tremendous enlargements are occasionally observed the liver extending well into the pelvis. The extent of the enlargement determines the presence of such symptoms as dragging sensations, fullness in the right upper abdominal quadrant and vague digestive disturbances. When the liver is not classically enlarged hepatic amyloidosis is difficult to diagnose. Until recent years no procedures which could record subclinical changes in hepatic function were in general use. Jaundice is rarely produced by uncomplicated amyloidosis of the liver (18). Dye retention tests and studies in bile pigment metabolism have not been of great value thus far. These studies have not however been carried far enough to permit the formation of any general conclusions. In the last few years it has been shown that alkaline phosphatase is increased in amyloidosis of the liver. Positive results have also been obtained with the thymol turbidity test. The striking thing about liver involvement is that the anatomic extent of the hepatomegaly shows little relation to the symptoms produced or to the findings of the tests of hepatic function.

Adrenal involvement occurs in about 40 percent of the patients. A few authentic cases of Addison's disease caused by amyloidosis have

(50) Krumphart E. *Textbook of Medicine* edited by Cecil R. L., and Kennedy F. J. W. B. Saunders Co. Philadelphia Pa. 1927 p. 1160.

(51) Parkes E. Lardaceous or boisteria disease. *British & Foreign Medical-Chirurgical Rev.* 14: 319. 1854.

been reported (52) (53). Despite the relatively high incidence of adrenal amyloidosis, however, characteristic symptoms of adrenal insufficiency are exceedingly rare. I have never observed it. Patients with generalized amyloidosis show asthenia, hypotension, and failure of the peripheral circulation, but these symptoms are best interpreted as part of the syndrome of the basic disease.

From the earliest description of amyloidosis in the literature up to the present, it has been realized that the most significant features were those produced by involvement of the kidneys. Many of the patients originally reported by Bright really had amyloidosis. The most common sign of renal involvement is albuminuria. This finding is of greatest significance when it is quantitatively progressive over a period of months. The absence of albuminuria, however, does not rule out renal amyloidosis. Hyaline and granular and waxy casts are found in the urine in varying numbers, particularly in the advanced stages. Hematuria and pyuria may also be present and should not therefore be considered as ruling out a diagnosis of amyloidosis. Polariscopic examination of the urine occasionally shows doubly refractile lipid bodies. Urinary concentration is generally unimpaired. In about 10 percent of the patients the amyloid involvement is so extensive that renal insufficiency results. When this occurs the manifestations are similar to those in chronic nephritis, i.e., fixation of the specific gravity of the urine, nitrogen retention, and uremia, but even when the amyloid kidney has produced uremia it is found at autopsy to be of normal size or slightly enlarged.

A sequence of clinical events is produced in renal amyloidosis which is most interesting and often gives the clue to the diagnosis. Although the nephrotic syndrome does not occur in all patients with renal amyloidosis, it occurs with sufficient frequency to make it of utmost significance. The pathogenesis of amyloid nephrosis has for its starting point the proteinuria. Inasmuch as albumin has the smallest molecular weight, it passes most easily through the renal glomerular unit when the permeability has been impaired. Microscopic examination of the amyloid kidney may show extensive destruction of glomeruli and replacement by amyloid. A definite mechanism for permitting serum albumin to filter through the glomeruli and into the urine is therefore present.

As the albuminuria increases, it is followed by a depletion of the serum albumin. Although this is not quantitatively proportionate, it is nevertheless generally consistent. When the serum protein is diminished, there follows a fall in the colloidal osmotic pressure of the blood. Eventually, as at which the osmotic pressure

(52) Hunter, W.  
disease report of  
(53) McClellan  
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d. 3 404-412 Oct. 1926.  
via. Am. J. M. Sc.

is no longer able to counteract the hydrostatic pressure in the capillaries and edema is produced. The subcutaneous edema fluid is poor in protein and similar to that in lipoid nephrosis. Elevated cholesterol values have been found in about half the cases. Although the edema of renal amyloidosis is usually moderate and confined to the lower extremities ascites and pleural effusions may be present.

The absence of hypertension is an important diagnostic sign and helps to differentiate this condition from chronic nephritis. The hypotension is probably caused by the debilitated condition of the patient. In those instances in which renal amyloidosis terminates in uremia hypertension may be present. Cardiac hypertrophy and retinal changes have also been observed.

Amyloidosis is a generalized disease affecting the most important organs of the body. Despite this fact the course of the illness is essentially that of the primary disease. Amyloidosis of the spleen and of the liver apparently are not directly responsible for the fatal termination. Adrenal insufficiency with death may be caused by amyloid but reports of such an occurrence are rare. Even the kidney damage which presents the most striking clinical manifestations of the disease produces a fatal outcome in only a small percent of instances. We may therefore conclude that in over 90 percent of the patients amyloidosis is not the direct cause of death. The presence of amyloid is usually an indication of progressive disease but patients with amyloidosis complicated by the nephrotic syndrome of 15 years' duration have been reported.

We may conclude therefore that if a patient is able to survive for many years with clinical manifestations of amyloidosis this condition is not a contraindication to specific therapy of the primary condition. Experimental evidence and clinical observations have shown that amyloid disease may regress if the underlying cause is removed. We have little hesitancy in using antibiotics for patients with amyloidosis. Surgical therapy is still undertaken with caution because of the poor general prognosis of the patient with amyloidosis. If the patient has a reasonable chance to survive an operation the presence of amyloid should serve as a stimulus for intervention. It is only by providing a definitive approach to the primary disease, usually tuberculosis, that we can offer the patient a chance of recovery from amyloidosis. Recovery from amyloidosis has been reported on several occasions (54) (55) but it is still unusual chiefly because the patient succumbs to the primary process. I have observed 2 cases of clinical recovery which I shall review briefly.

(54) Walker G. F.: Case of recovery from amyloid disease. *Lancet* 2: 120 July 21 1928

(55) Gairdner W.: In discussion of Delafield F.: Diseases of kidneys, *Trans. A. Soc. Am. Phys.* 6: 149 1891



## CASE REPORTS

**Case 8**—A 34-year-old man was admitted to the Montefiore Hospital in August 1931 with a history of productive cough and fever of 5 months duration. Examination disclosed bilateral fibrocaceous infiltrations with a large cavity in the upper lobe of the right lung. The sputum was positive for *Mycobacterium tuberculosis*. Shortly after admission an artificial pneumothorax was induced on the right side. This was complicated by a mixed empyema. Aspiration and irrigation were unsuccessful and a thoracotomy was performed in May 1932. In the ensuing months improvement was continuous and by August 1933 the patient was in excellent condition with negligible drainage from the thoracotomy sinus. His pulmonary condition had also improved with apparent closure of the cavity on the right side and absorption of the infiltrations on the left. The patient was discharged from the hospital in August 1934 with persistently negative sputum.

The amyloid history is most interesting. The patient had a progressive albuminuria following his admission in August 1931. In July 1932, 2 months after the thoracotomy, his liver was palpable. In October 1932 the total serum proteins were reduced to a level of 4.32 grams and peripheral edema was present. In February 1933 the Congo red test which had previously shown partial retention showed 100 percent retention. The spleen which had been barely felt previously was definitely enlarged. The edema was also more extensive. The progression of the amyloid manifestations had taken place at a time when the pulmonary disease was showing marked improvement.

Resolution of the amyloidosis became apparent in November 1934 when the Congo red test showed equivocal retention. The liver was still enlarged but the spleen could no longer be felt. Peripheral edema was very light and the albuminuria had been reduced to 2 grams per day. The serum proteins were elevated to 6.7 grams. On the patient's last check-up in the latter part of 1935 hepatomegaly, splenomegaly and edema were no longer present. The albuminuria, although further reduced, was still present. The general condition of the patient was excellent.

**Case 9**—A 22-year-old man became ill in 1933. In 1934 an artificial pneumothorax was induced for a cavity in the upper lobe of the left lung. This was complicated by a tuberculous empyema for which a thoracotomy was performed in 1936. Later that year an 8-rib thoracoplasty was performed in an attempt to obliterate the empyema cavity on the left side. In 1937 the thoracoplasty was revised but this operation was also unsuccessful. In 1939 an abscess of the left anterolateral chest wall was incised. In 1940 the patient had another revision of the thoracoplasty which was also unsuccessful. There was continuous drainage from multiple abscesses on the lateral chest wall. Between 1944 and 1946 several fistulous tracts were observed.

In 1947 penicillin was given parenterally and locally without producing any improvement. Tyrothricin was also instilled into the empyema cavity without altering the course of the disease.

In 1947 the patient was semicachectic. The left hemithorax was markedly shrunken as a result of fibrosis and the multiple rib resections. There were 2 large sinuses in the left axilla from which drained a profuse foul purulent discharge which required constant change of dressings. The upper lobe of the right lung contained a fibrotic lesion. Examination of the sputum and gastric contents were negative for *M. tuberculosis*. In summary the patient had had a tuberculous empyema on the left side since 1936 which had been draining continuously since 1939. Streptomycin therapy was instituted in April 1948 and continued through the early part of June 1948. A total of 100 grams was given parenterally. There was no local treatment. Examination in December 1948 showed that both sinuses had closed. The patient's general condition had improved greatly and he had gained 30 pounds since starting treatment.

The amyloid history began in 1940 when progressive albuminuria was noted. Shortly after this the patient began to complain of dull abdominal pain and diarrhea. The abdomen became enlarged and the liver was palpable. The Congo red test showed 100 percent retention. Studies in December 1946 showed impairment of urinary concentration, the liver edge 3 cm. below the costal border, an alkaline phosphatase of 12.9 and cholesterol of 161 with a normal ratio of esters. The total serum proteins were 6.6 grams and there was no edema.

Between December 1946 and January 1947 an attempt was made to treat the amyloidosis with liver extract parenterally, yeast, and a high-calory, high-protein diet. There was no response to this treatment. Examination of the patient in April 1948 showed slight progression of his amyloidosis. The urinary concentration was further impaired, the liver edge was 5 cm. below the costal border, and the alkaline phosphatase was 18. In addition the prothrombin time was increased to 24.5 seconds and the thymol turbidity test was positive. A check-up in December 1948 about 6 months after discontinuing the streptomycin treatment revealed a total serum protein level of 8.2 grams. Renal function showed marked improvement. The liver had diminished in size and of even greater significance it felt soft. The patient was last observed in May 1949 at which time the liver was barely palpable.

In the past century many unsuccessful attempts were made to introduce specific therapy for amyloid degeneration. Potassium iodide, liquor potassii arsenitis, and various alkalies were tried. Iodide therapy was probably beneficial in those instances in which the amyloidosis was caused by syphilis. In 1932 Whitbeck (36) reported excellent

(36) Whitbeck, B. H.: Li et meal in treatment of amyloidosis in surgical tuberculosis. *J. Bone & Joint Surg.* 14: 83-92, Jan. 1932.

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## CASE REPORTS

**Case 8**—A 34-year-old man was admitted to the Montefiore Hospital in August 1931 with a history of productive cough and fever of 5 months duration. Examination disclosed bilateral fibrocascous infiltrations with a large cavity in the upper lobe of the right lung. The sputum was positive for *Mycobacterium tuberculosis*. Shortly after admission an artificial pneumothorax was induced on the right side. This was complicated by a mixed empyema. Aspiration and irrigation were unsuccessful and a thoracotomy was performed in May 1932. In the ensuing months improvement was continuous and by August 1933 the patient was in excellent condition with negligible drainage from the thoracotomy sinus. His pulmonary condition had also improved with apparent closure of the cavity on the right side and absorption of the infiltrations on the left. The patient was discharged from the hospital in August 1934 with persistently negative sputum.

The amyloid history is most interesting. The patient had a progressive albuminuria following his admission in August 1931. In July 1932, 2 months after the thoracotomy, his liver was palpable. In October 1932 the total serum proteins were reduced to a level of 4.32 grams and peripheral edema was present. In February 1933 the Congo red test which had previously shown partial retention showed 100 percent retention. The spleen which had been barely felt previously was definitely enlarged. The edema was also more extensive. The progression of the amyloid manifestations had taken place at a time when the pulmonary disease was showing marked improvement.

Resolution of the amyloidosis became apparent in November 1934 when the Congo red test showed equivocal retention. The liver was still enlarged but the spleen could no longer be felt. Peripheral edema was very slight and the albuminuria had been reduced to 2 grams per day. The serum proteins were elevated to 6.7 grams. On the patient's last check-up in the latter part of 1935 hepatomegaly, splenomegaly and edema were no longer present. The albuminuria although further reduced, was still present. The general condition of the patient was excellent.

**Case 9**—A 22-year-old man became ill in 1933. In 1934 an artificial pneumothorax was induced for a cavity in the upper lobe of the left lung. This was complicated by a tuberculous empyema for which a thoracotomy was performed in 1936. Later that year an 8-rib thoracoplasty was performed in an attempt to obliterate the empyema cavity on the left side. In 1937 the thoracoplasty was revised but this operation was also unsuccessful. In 1939 an abscess of the left anterolateral chest wall was incised. In 1940 the patient had another revision of the thoracoplasty which was also unsuccessful. There was continuous drainage from multiple fistulas on the lateral chest wall. Between 1944 and 1946 several fistulectomies were performed but the sinuses reopened.

In 1947 penicillin was given parenterally and locally without producing any improvement. Tyrothricin was also instilled into the empyema cavity without altering the course of the disease.

In 1947 the patient was semicachectic. The left hemithorax was markedly shrunken as a result of fibrosis and the multiple rib resections. There were 2 large sinuses in the left axilla from which drained a profuse foul purulent discharge which required constant change of dressings. The upper lobe of the right lung contained a fibrotic lesion. Examination of the sputum and gastric contents were negative for *M. tuberculosis*. In summary the patient had had a tuberculous empyema on the left side since 1936 which had been draining continuously since 1939. Streptomycin therapy was instituted in April 1948 and continued through the early part of June 1948. A total of 100 grams was given parenterally. There was no local treatment. Examination in December 1948 showed that both sinuses had closed. The patient's general condition had improved greatly and he had gained 30 pounds since starting treatment.

The amyloid history began in 1940 when progressive albuminuria was noted. Shortly after this the patient began to complain of dull abdominal pain and diarrhea. The abdomen became enlarged and the liver was palpable. The Congo red test showed 100 percent retention. Studies in December 1946 showed impairment of urinary concentration, the liver edge 3 cm. below the costal border, an alkaline phosphatase of 12.9 and cholesterol of 161 with a normal ratio of esters. The total serum proteins were 6.6 grams and there was no edema.

Between December 1946 and January 1947 an attempt was made to treat the amyloidosis with liver extract parenterally, yeast and a high-calorie, high-protein diet. There was no response to this treatment. Examination of the patient in April 1948 showed slight progression of his amyloidosis. The urinary concentration was further impaired, the liver edge was 5 cm. below the costal border and the alkaline phosphatase was 18. In addition the prothrombin time was increased to 24.5 seconds and the thymol turbidity test was positive. A check-up in December 1948 about 6 months after discontinuing the streptomycin treatment revealed a total serum protein level of 8.2 grams. Renal function showed marked improvement. The liver had diminished in size and of even greater significance it felt soft. The patient was last observed in May 1949 at which time the liver was barely palpable.

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(56) Whitbeck, B. H.: Li er meal in treatment f myl idosis in argical tuberculosis. J. Bone & Joint Surg. 14: 85-92 Jan. 1932.



# Psychodynamic Factors in a Case of Self-Inflicted Wound

James C. Skinner *Captain, MC, U. S. A.* (1)

Martin A. Berexin *M. D.* (2)

A REPORT is presented on the successful treatment by psychiatric methods of a soldier suffering from almost total disability of the right hand and right arm following an accidental self-inflicted gunshot wound. It is hoped that this case may illustrate some psychologic factors which accompany and complicate such injuries.

## THE ORGANIC INJURY

A 19-year-old male recruit was first admitted to Murphy General Hospital in December 1948 with a penetrating wound of the right hand without arterial or neural involvement with the point of the bullet in the middle surface of the hand at the head of the second metacarpal. There were associated fractures of the heads of the second, third, and fourth metacarpals. The patient states that the wound was caused by the accidental discharge of a .22 caliber rifle while he was on leave. An immediate surgical debridement was performed with removal of the missile.

Despite a technically successful operation the patient complained of extreme pain in the hand, failed to cooperate with the orthopedists and physical therapists, and stated that the skin of the entire hand was so sensitive that he could not endure its being handled. In view of his resistance to treatment, no progress was made in the direction of mobilization. The skin over the entire dorsum of the hand became tense, red, and smooth, and extreme edema of the entire hand developed together with increasing wasting of the muscles of the hand and arm. The ward surgeons believed that he was deliberately opposing their efforts at rehabilitation, and it was rumored by other patients on the ward that the patient deliberately let his arm hang over the side of the bed at night apparently in an effort to increase the edema. Be-

(1) At time of writing assigned to Neuropsychiatric Section, Murphy General Hospital, Waltham, Mass.

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results with liver therapy in patients with amyloidosis caused by osseous tuberculosis. Favorable results were also reported by Jacobl and Grayzel (7). This work was received enthusiastically but attempts to duplicate it in patients with amyloidosis caused by pulmonary tuberculosis have generally been unsuccessful. I have never believed that liver therapy either parenterally or orally contributed more than general supportive treatment. Cohen (57) while noting some improvement in patients with amyloidosis following liver therapy could not attribute the improvement specifically to this treatment.

The best results with liver therapy were obtained in those patients in whom the primary disease was relatively benign such as those with osseous tuberculosis. In patients with amyloidosis and progressive pulmonary tuberculosis the results were unsatisfactory. The approach to the treatment of amyloidosis is therefore that of treatment of the primary disease. If this can be eradicated or controlled the amyloidosis will show regression. Supportive therapy in the form of liver or special diets is not condemned but the use of such measures should not obscure the main issue which is the treatment of the primary disease.

### CONCLUSIONS

Amyloidosis occurs chiefly as a complication of progressive pulmonary tuberculosis. It may involve every organ of the body but is found most frequently in the spleen, kidneys, liver and adrenals. The liver and spleen despite the frequency of implication rarely produce symptoms of functional change. The characteristic signs of amyloidosis are produced by involvement of the kidneys. The manifestations range from albuminuria to the fully developed nephrotic syndrome. In a small percent of patients renal amyloidosis terminates in uremia. Secondary amyloidosis may persist for many years depending on the duration of the primary condition. If the cause of the amyloidosis is eradicated the disease will retrogress. This has been shown both by experimental and clinical observations. The presence of amyloidosis should serve therefore as a stimulus for definitive treatment of the primary condition if this is at all possible.

(57) Cohen, S. (Rochester, N. Y.): Amyloidosis complicating tuberculosis—diagnosis, prognosis and treatment. *Ann. Int. Med.* 19: 990-1002, Dec. 1943.

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ing at a window and telling him that she would never come back. He spoke of how unhappy this made him and in the next interview described trips that he had taken alone to the town in which she was buried and how he carried flowers to her grave and lay there thinking of her for hours at a time. He had never told anyone else of these adventures.

At this time when the patient had been in therapy about 2½ months he spontaneously initiated a device for producing visual phantasies. One day while looking out the office window he stated that it reminded him of something in his past. He was asked to imagine the window as a screen and to relate what he could see reproduced on that screen. The only image he obtained (and one which recurred throughout the treatment) was that of an empty room with light streaming down from a window and illuminating a myriad of dust particles floating in the air. He remarked several times that there was nothing else in the room—and yet it seems as if there should be something else there—it is as though I am looking for something.

In the next interview the patient stated that occasionally when he lay before his mother's grave he would imagine digging up the coffin and opening it but he could not imagine why he should think of such a strange thing. It was suggested to him that perhaps he wished to prove that the coffin would be empty and that his mother was still alive. He admitted that this was true and that he had actually had this phantasy although he would not have dared speak of it.

At the end of the third month of treatment the patient showed evidence of a positive transference bringing to the therapist as though they were gifts bits of information which neither then nor later seemed to have much significance but which he always said were things he could never tell anyone else. He also suggested that perhaps he could tell more if the interview were conducted on his ward some night when it was dark because he could talk more easily in the dark.

Although his attitude was more cooperative at this point his general behavior on the ward in the clinic and in physiotherapy was still hostile uncooperative and suspicious. The members of the physiotherapy department were seriously concerned over continuing treatment and there was some talk of amputation by the orthopedic surgeons in case no improvement occurred within the next month.

At the beginning of the fourth month of treatment the patient talked again of his mother. He recalled a schoolboy fight in which he had engaged during his first year of school and of how well he thought his mother had handled the situation by inviting the injured child to a party at the patient's house the next day. He said this made him ashamed as though he had hurt his mother. He recalled his dislike of fighting and spoke of another time when in junior high school, he had been ridiculed into a fight and an older woman had said "What a vicious right arm you

cause of this, he was first referred to the psychiatric service about 2 months following his injury. Psychiatric treatment was instituted, in the form of regular 50-minute interviews two or three times a week for the next 6 months.

### THE THERAPEUTIC INTERVIEWS

At the time of the first interview the patient was exceedingly aggressive and uncooperative. A cue for the attitude of the therapist during these early hours of treatment was taken from the fact that the patient expressed a great deal of anger at what he considered to be the unwarranted attempts of the doctors and nurses to force therapy of his hand. It was decided that the therapist should ignore the hand and concentrate from the beginning on the attitudes of the patient. Therefore the early interviews were largely concerned with the patient's dissatisfaction and anger with the doctors and nurses, his belief that they doubted his suffering and his contention that his hand would get well if they would only leave it alone.

Late in the first month of treatment the patient was asked to talk about his family, a subject which he had up to this point, avoided in interview and also in reality for although his home was nearby he had not visited it during his stay in the hospital. He spoke with bitterness about his family and stated that he wanted nothing more to do with them. He described the family group as consisting of his paternal aunt, his father and two older sisters. His mother had died when he was 8 or 9 years old and he had then been taken into the aunt's home. He expressed great dislike for his aunt and during the next few interviews spoke largely of how much he hated her. He described her as a domineering interfering unpleasant person who never smiled. He stated that she had never understood him, that she refused to allow him to lead his own life and that he did not ever wish to see her again. During the next few interviews he illustrated the violence of his dislike by saying that if his aunt should ever visit the hospital, he would hide rather than meet her. Some exploration of this feeling was undertaken, and it was found that the patient had extremely violent phantasies of striking his aunt, and he was able eventually to discuss several occasions in the past when he had been tempted to strike her with objects close at hand. (The therapist noted at this time that all of these phantasies referred to the injured right hand but made no reference to this fact.)

At this point a change occurred in the subject matter of the interviews. The patient began to speak of his mother and how great a contrast there was between her and his aunt. He described his mother as a gentle kind and understanding person and stated that he had never gotten over the loss he had sustained in her death. In speaking of this he suddenly stopped in amazement and remarked that he was surprised to find that he had no memory of her death. He could only recall her being ill in the hospital and then his father about 2 weeks later standing

ing at a window and telling him that she would never come back. He spoke of how unhappy this made him and in the next interview described trips that he had taken alone to the town in which she was buried and how he carried flowers to her grave and lay there thinking of her for hours at a time. He had never told anyone else of these adventures.

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h ve! At this point the therapist remarked that it was interesting how frequently he made references to the use of this right arm and hand and that all these references were to acts of violence. He seemed to accept this and agreed that it was strange. From that time the patient seemed aware in the interviews that therapy was directed toward his hand, although he expressed some doubt concerning the possible relationship between his emotions and his injury.

Because there was at this time growing concern on the part of the surgeons and the chief of the physiotherapy section as to the increasing edema and what was considered the imminent loss of function of the hand, the psychiatric staff believed that the focus of the work would have to be placed more directly on his refusal to cooperate in treatment. At the suggestion of the visiting neuropsychiatrist it was therefore pointed out to the patient after some inquiry into how faithfully he performed the exercises prescribed for him that he didn't seem to want the hand to get well. He readily admitted this and indeed said that he had known for a long time that he did not want it to get well, but that he could not understand why. He admitted that it would be a severe handicap to lose the hand but that somehow it did not seem to matter. Following this interview although the patient did not cooperate any more fully with the physical treatment, it was understood tacitly between the patient and the psychiatrist that the major subject of inquiry and treatment was to determine why he could not tolerate having the hand get well.

The fact that the hand was so often associated in his thought with acts of violence was pointed out to the patient, and during the next two or three interviews following this he stated that his hand disgusted him, that he could not bear to hold it up where he could see it, that it reminded him of a horror movie which he had seen as a child in which a clawlike hand was associated with murder and violence and finally that he would just as soon have it cut off.

In the fifth month of treatment the patient discussed some of his recent experiences on the ward. One of these involved the night when he had awakened with symptoms of an anxiety attack (the first anxiety that he had reported during treatment) and wandered out to the desk at the nurses station. Here he remarked on the light streaming through the curtained pictures in the air and again related this to the phantasy previously mentioned. A week or so later he reported having been out to the canteen near the hospital, while sitting in the lighted room, he had experienced a good deal of anxiety and had felt as though he were close to some answer. He watched the light pouring down on the head of a blonde sitting cross the room with her back to him.

In two subsequent interviews he again discussed his aunt and at this time spoke of how he had come into the Army to get away from home. For the first time he described the incident immediately preceding his induction. He said that he had been visiting another aunt

apartment and had left the house after she had but had subsequently gone back to get a possession he had left behind. He had been seen re-entering by the landlady. Later that day the aunt with whom he lived accused him of attempting to steal something. His resentment resulted in his escape by enlistment.

Finally toward the end of the fifth month of treatment and at a time when the surgical service believed that the nerve supply to the hand had probably been irreparably injured the patient recalled an incident in his childhood which he said he had forgotten until then. He remembered awakening one night at the age of 4 or 5 years and saw light streaming out of the kitchen. He heard a great deal of noise within and on creeping to the door saw his father and mother arguing. In the midst of the argument he saw his father lift a pan of hot grease from the stove and throw part of it at his mother, burning her leg. He said that at the time he felt like choking his father. It was only with the greatest difficulty that he had been able to relate this incident because it was quite a terrible thing to have such thoughts about one's father. In the next interview he wondered briefly and rather vaguely if he thought his father could have had something to do with his mother's death and again recalled his anger when, after the funeral his father said *There's no way to get her back.*

In the next few interviews the intensity of his concern and his anxiety appeared to mount and finally following 1 hour in which he was unable to speak, he spoke with extreme anxiety about another incident which had occurred in his childhood and which he said he had forgotten until then. This time he was playing ball with some other children and had walked away from the field carrying either a glove or bat when he was suddenly seized from behind by someone attempting to stop him. He grappled with this person and eventually succeeded in turning around and striking his assailant so forcibly and repeatedly across the face that finally he knocked him to the ground only then to discover that it was the sister of one of the boys dressed in slacks. This memory disturbed him a great deal. He spoke of how ashamed he was and of what a terrible thing it was to hit a girl.

In the next interview the patient was returned to this topic by the doctor. He said that he had often thought of how rotten a thing it was to do. When asked to explain his feelings he said, *That girl has probably grown up to be somebody's mother and if anyone struck my mother I'd break every bone in my hand hitting him. It was pointed out to him that although he hadn't broken every bone in his hand he had broken a goodly number. He looked down in surprise at his hand started to say something and then paused explaining that he had had a silly thought. When pressed for his thought he finally said that he had wondered if this injury had come about in punishment to him for not having hit his father as he wished to do the night he saw him throw the hot grease at his mother.*



In the next interview the patient had great difficulty in talking but finally when the examiner repeated to him the content of the last interview emphasizing the three things the patient had spoken of i. e. his father striking his mother his striking the little girl his concern about someone striking his mother and his own feeling of wanting to strike his father he then became very anxious and said that he could not think about it any more. After some reassurance the patient became relaxed and said that once more he was conscious of the empty room with the sunlight streaming through the window but that this time he felt that there was something in the room at which he did not want to look something he was running away from. He was asked to look at this thing but he said he could not.

The next morning before the regular interview the patient came excitedly to see the psychiatrist saying that during the night he had remembered some further incident and had forgotten it again on awakening but that it had returned to him again while sitting in the physiotherapy clinic waiting treatment. One night, when he was 4 or 5 years old, he had gone to the pantry to get some jam and his father seeing the light in the kitchen, had followed and reprimanded him. In anger the patient swung around with the jam jar in his hand and struck his mother who had unexpectedly entered the room squarely in the pit of her stomach with the jar. Everyone was excited; his mother was in pain, and he was sent to bed having been told that boys who hit their mothers aren't wanted in this house. Try as he would to explain that his act was entirely unintentional he was not believed. Finally he crept into his parents' bedroom and there caressed his mother while his father stolidly and angrily turned his back to him from across the room.

### THE THERAPEUTIC RESULT

After this interview the patient returned to his ward but the next morning appeared in great excitement to demonstrate that his hand was now entirely normal in size and that the edema had completely disappeared. The patient maintained that he had not changed the position of the hand in any way from that in which he had been carrying it for the preceding 6 months. That same day he requested extra treatment in physiotherapy and on that same afternoon asked to have his long malshapen nail cut and to have his finger exercises. Passive exercise was carried out under sedation with 0.4 gram of sodium amytal. About 48 hours after this interview described, the patient had complete voluntary motion of all digits wrist, and elbow and there appeared to be no calcification or loss of neural function.

Equally dramatic was the way in which the lifting of this particular segment of childhood amnesia dispelled other areas of amnesia throughout his life history some of which had not been suspected. In the first interview after his recall of the boyhood incident, the patient suddenly found that he remembered the circumstances of his mother's death and funeral. He recalled in amazement that she had died of

something wrong with her stomach and then spontaneously said "Why Doc I must have thought I killed her—I know I thought that. I guess that's why I couldn't remember it—but I didn't kill her did I?" After reassurance that his blow couldn't have had anything to do with his mother's death 4 or 5 years later he said "It's funny how even though I didn't remember it could make me think such a crazy thing." In addition within the next few interviews it became clear to both the patient and the physician just why the incident in which he was accused of taking something from his aunt's apartment should have precipitated his flight into the Army. It was a repetition of the earlier situation in which he was accused of doing something wrong and had not been allowed to present his own defense.

As dramatic as the change in the patient's hand was the change in his behavior and mood. He became cheerful, worked vigorously in physiotherapy several times a day in an effort to increase the strength of his hand, voluntarily offered his services as a helper in that department, began to lead a full and active social life, and was full of plans for the future.

The interviews were gradually reduced in number and although it was believed that there were still unexplored areas, particularly in relation to the patient's sexual phantasies which he had avoided throughout the treatment, his recovery was sufficient to warrant discontinuance of further interviews.

### DISCUSSION

This case report is a dramatic illustration of the relationship of the unconscious psychic activity to an overt organic condition. The psychodynamics elicited follow the pattern observed in conversion hysteria. In such a situation a part of the body is used to express symbolically an unconscious conflict. The conflict and its attendant guilt had remained unconscious in this patient for many years only to be precipitated by a symbolic and stressful situation and ultimately expressed in the punitive attempt to destroy the offending hand and arm.

In one sense the gunshot wound of the hand may be construed as a suicidal equivalent, but fortunately for the patient he elected, instead of destroying himself to destroy the offending arm. By destroying his hand and arm he would have succeeded in achieving atonement and in preventing himself from ever repeating the guilt-laden aggressive act again. Although only the aggressive component relating to the arm was elicited, it would not be correct to assume that this aggression is the only factor to be considered in the psychodynamic formulation. It is well known that the involved limb in conversion hysteria serves as a libidinal symbol and it is thus to be expected that continued study might have demonstrated other unconscious phantasies related to the classical content of the castration complex.

Of particular interest and gratification in this case was the recognition by the various ward surgeons that there was something more than an ordinary organic condition present. By this recognition and the subsequent psychiatric consultations a degree of teamwork was established which eventually resulted in salvaging the patient.

Inasmuch as this report concerns itself with a patient with a self-inflicted gunshot wound, it should be remembered that not all such patients would necessarily show the psychodynamic formulation presented here. All such patients should, however, have the benefit of adequate psychiatric consultation.

# Carbon Tetrachloride Nephrosis

## Report of Patient Treated Conservatively

I Louis Hoffman, *Lieutenant Colonel, U S A, F (MC) (1)*

Richard R. Grayson, *Lieutenant junior grade MC, U S N R (1)*

**A** CASE of anuria resulting from the inhalation of carbon tetrachloride fumes by a man who had been drinking alcoholic beverages in excess is reported to emphasize the dangers of carbon tetrachloride and to indicate the favorable prognosis when proper treatment is instituted. An unusual feature of this case which we believe never to have been previously reported was the marked kidney enlargement during the course of the disease as demonstrated roentgenographically.

**Incidence**—Until recent years lower nephron nephrosis caused by inhalation of carbon tetrachloride fumes has not been considered a common entity. With increasing knowledge and awareness of the disease however particularly in the last 5 years more case reports have been published. Farrer and Smith (2) recently reported a total of 12 cases with 5 deaths in 5 000 admissions over a 2-year period. This was twice the number of cases of subacute bacterial endocarditis not a medical rarity diagnosed during the same period of time in their hospital.

**Etiology**—The inhalation of carbon tetrachloride fumes affects primarily the kidneys whereas the ingestion of the liquid causes lesions in the liver (3). Damage to both the liver and the kidneys (the hepatorenal syndrome) has occasionally been reported (4). Konwaler and Noyes (5) list the factors which encourage poisoning by carbon

(1) R. es. Air Force Base, Lubbock, Tex.

(2) Farrer R. M. and Smith R. H., Carbon tetrachloride nephrosis: frequently undiagnosed cause of death. J. A. M. A. 143: 965-967 July 15 1950.

(3) McGee C. J., Lower nephron nephrosis; carbon tetrachloride poisoning with report of 13 cases. Am. J. M. Sc. 218: 636, Dec 1949.

(4) Dillesberg, S. M., and Thompson, C. M., Carbon tetrachloride poisoning, report of 20 cases with one death. Mil. Surgeon 97: 39-44 July 1945.

(5) Konwaler B. E., and Noyes C. B., J. N., Carbon tetrachloride poisoning; report of 1 case. California & West. Med. 61: 16-20 July 1944.

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I Louis Hoffman, *Lieutenant Colonel, U S A. F (MC) (1)*

Richard R. Grayson *Lieutenant, junior grade MC, U S N R (1)*

**A** CASE of anuria resulting from the inhalation of carbon tetrachloride fumes by a man who had been drinking alcoholic beverages in excess is reported to emphasize the dangers of carbon tetrachloride and to indicate the favorable prognosis when proper treatment is instituted. An unusual feature of this case which we believe never to have been previously reported was the marked kidney enlargement during the course of the disease as demonstrated roentgenographically.

**Incidence** —Until recent years lower nephron nephrosis caused by inhalation of carbon tetrachloride fumes has not been considered a common entity. With increasing knowledge and awareness of the disease however particularly in the last 5 years more case reports have been published. Farrier and Smith (2) recently reported a total of 12 cases with 5 deaths in 5 000 admissions over a 2-year period. This was twice the number of cases of subacute bacterial endocarditis not a medical rarity diagnosed during the same period of time in their hospital.

**Etiology** —The inhalation of carbon tetrachloride fumes affects primarily the kidneys whereas the ingestion of the liquid causes lesions in the liver (3). Damage to both the liver and the kidneys (the hepatorenal syndrome) has occasionally been reported (4). Konwaler and Noyes (5) list the factors which encourage poisoning by carbon

(1) Rees Air Force Base Lubbock, Tex.

(2) Farrier, R. M., and Smith, R. H.: Carbon tetrachloride nephrosis; frequently undiagnosed cause of death. *J. A. M. A.* 143: 965-967 July 15 1950.

(3) McGee, C. J.: Lower nephron nephrosis carbon tetrachloride poisoning with report of 3 cases. *Am. J. Med. Sci.* 218: 636, Dec. 1949.

(4) Dillenborg, S. M., and Thompson, C. M.: Carbon tetrachloride poisoning; report of 20 cases with one death. *Mil. Surgeon* 97: 39-44 July 1945.

(5) Konwaler, B. E., and Noyes, C. B., Jr.: Carbon tetrachloride poisoning; report of 1 case. *California & West. Med.* 61: 16-20 July 1944.

tetrachloride as (1) alcoholism, (2) excessive exertion, (3) the ingestion of a heavy meal prior to exposure and (4) exposure to heat. They further state that alcoholics and those having nephritis, diabetes mellitus, myocardial degeneration, or high blood pressure should not be permitted to work with carbon tetrachloride.

**Pathology**—Liver damage when present is evidenced by central necrosis. The lesions of the kidney are those of lower nephron nephrosis. Konwaler and Hayes (5) reported a fatal case with large white kidneys weighing 350 grams each. McGee (3) reported a case in which the microscopic renal lesions were pigment casts, degeneration of the ascending limb of Henle's loop, interstitial inflammation at the cortico-medullary junction and foci of venous thrombosis.

**Symptoms**.—Exposure to the fumes of carbon tetrachloride results in varying degrees of illness which cover a wide spectrum of clinical states. This spectrum encompasses the person who is stricken with influenzalike symptoms for a day or two with or without albuminuria, and the person who develops complete anuria. Between these two extremes are many degrees of illness. The symptoms most commonly noted are severe headache, nausea, vomiting, prostration, giddiness, muscle pains and diarrhea (4). The nausea and vomiting seem to be a universal problem and if accompanied by oliguria or anuria constitute a complicating factor in fluid therapy. The vomiting is usually intractable. A hemorrhagic diarrhea is also mentioned (3) (4).

**Treatment** of this disease must be predicated on the following fundamental considerations:

1. The kidney damage is reversible and the disease is self-limited. According to Kugel (6) tubular regeneration begins on the third day after the injury and is complete on the fourteenth day. Spontaneous diuresis occurs by the eleventh or twelfth day.

2. Most patients who die during the treatment for anuria or oliguria resulting from poisoning by carbon tetrachloride die as a result of overtreatment. The literature is replete with reports of patients who succumb to congestive heart failure as the result of overzealous fluid therapy (7).

3. Other patients die as the result of potassium intoxication (7) (8).

In general, then, the purpose of the treatment is to keep the patient alive until the return of renal function. The patient is assumed to have

(6) Kugel, V. H. Management of acute toxic nephrosis. *Am. J. Med.* 3: 183-205, Aug. 1947.

(7) Friedberg, C. K. Congestive heart failure of renal origin; pathogenesis and the treatment in 4 cases of carbon tetrachloride nephrosis. *Am. J. Med.* 9: 164-174, Aug. 1950.

(8) Hicks, M. H., Crutchfield, A. J. and Wood, J. E. Intestinal lavage in potassium intoxication of lower nephron nephrosis. *Am. J. Med.* 9: 57-61, July 1950.

lost about 1 000 cc of fluid per day by respiration and perspiration. If this amount of fluid plus the amount of fluid lost by emesis and urination is replaced and the amount of sodium and potassium administered is rigidly restricted most of the pitfalls of overzealous therapy can be avoided (9). A semblance of nutrition is maintained and ketosis is minimized by the liberal administration of dextrose and vitamins. Serial electrocardiographic studies are made for detecting the occurrence of hyperkalemia. If hyperkalemia should occur such methods as the use of the artificial kidney (7), intestinal lavage (8), peritoneal lavage (10) or replacement transfusions (7) become necessary.

After diuresis has begun, urination may be excessive and the patient may pass in excess of 10 000 cc in 1 day (9). At this time hyponatremia, hypokalemia, hypocalcemia and dehydration must be avoided by proper replacement therapy. It is conjectured that the diuresis is caused by the poor concentrating power of the convalescing tubules and/or to the previous overhydration.

### CASE REPORT

A 27-year-old white male cook presented himself at the dispensary on the morning of 6 October 1950 complaining of sore muscles, nausea and vomiting and a cough with the production of "yellow phlegm." Physical examination at this time revealed nothing of significance except a markedly reddened pharynx, slight epigastric tenderness and a temperature of 102° F. He was admitted to the hospital with the diagnosis of influenza and therapy with aureomycin was begun. That evening the nurse reported that the patient had not voided since admission. Catheterization was attempted but was unsuccessful. Several hours later the patient spontaneously voided 60 cc of dark red urine. Urinalysis revealed a specific gravity of 1.021, acid reaction, 4 plus albumin, 6 to 8 erythrocytes and an occasional leukocyte per high power field. No casts were seen at this time but several days later granular casts appeared in the urine.

Further questioning of the patient revealed that he apparently had not urinated for the previous 48 hours. He stated that he was perfectly well until 30 September 1950 at which time he consumed over a period of several hours about a quart of whiskey and an unknown quantity of beer. He was able to drive to work the next morning. He drank an unknown quantity of beer daily up to and including 3 October. On 4 October at 0800, a repairman cleaned the motors of the refrigerator units in the kitchen in which the patient was working. A 1-gallon pail of carbon tetrachloride which was open to the air was used for this purpose. The patient was seated several yards away in front of an open window.

(9) Muirhead, E. E., *Lecture on the Treatment of Lower Nephron Nephrosis*, South Plains Medical Society Meeting, Lubbock, Tex., September 1950.

(10) Odell, H. M., Ferri, D. O., and Power, M. H., *Peritoneal Lavage—effective means of extrarenal excretion*, *Am. J. Med.* 9: 63-77, July 1950.



for the hour and a half that the work was in progress. That night the patient drank several more cans of beer. He began to feel sick the next day and reported to the dispensary about 48 hours after exposure to the fumes of carbon tetrachloride. He had no insight as to the relation of the carbon tetrachloride fumes to his illness and it took 2 days of persistent probing into the history before he remembered that he was in the vicinity of carbon tetrachloride fumes.

The patient was extremely ill for 2 weeks. Each day he passed more urine until the tenth day after exposure when the amount reached 1 liter in 24 hours. On the eleventh day he voided 2,900 cc. and on the fifteenth day 4,800 cc. of very dilute (sp. gr. 1.007) urine at which time vomiting ceased. The vomiting had been intractable and had lasted 2 weeks. He failed to respond to atropine sedation with seconal given rectally, pyridoxine and vitamin B complex intramuscularly and intravenously or to intramuscular injections of liver extract. During the greater part of these 2 weeks he complained almost constantly of pain in the left upper abdominal quadrant. The abdomen was extremely tender to palpation and there was marked left costovertebral tenderness to deep percussion. A flat film of the abdomen taken on 9 October revealed the left kidney to be enlarged to about twice the normal size with the lower pole reaching almost to the transverse process of the fourth lumbar vertebra. The right kidney could not be definitely visualized. Neither kidney was palpable. Serial roentgenograms revealed no decrease in the size of the left kidney until 23 October, 19 days after exposure. An intravenous pyelogram on 6 November, 1 month after admission, revealed normal urinary tract. The kidneys at this time appeared to be of normal size.

On the eighth, ninth and tenth days of illness periorbital edema appeared apparently the result of excess sodium administration. At no time, however, was there any respiratory distress. Neither were rales in the lung bases ever noted nor was ankle edema demonstrated. About this time swelling of the salivary glands also appeared. The parotids were lightly enlarged and the subaxillary glands markedly so. The salivary ducts were not inflamed and the patient had no fever. This swelling disappeared spontaneously after a few days. The blood pressure on admission was 118/83. At no time during the illness did it rise above 140/90. The patient's weight was recorded daily in order to detect hidden edema. It remained stationary during the first 10 days of illness and then gradually fell off until after 3 weeks he had lost a total of 20 pounds (He then weighed 154 pounds.)

Some of the laboratory findings are shown in table 1. The serologic tests were negative. The cephalin-cholesterol flocculation test was negative on 10 October. On this date also the total protein was 8.2, albumin 5.3, globulin 2.9, icteric index 8 and direct van den Bergh zero. Because of the lack of facilities the carbon dioxide combining power was determined only once when on the eighth day of illness it was found to be 47. A concentration dilution test 5 weeks after the



onset of illness produced a specific gravity ranging from 1.003 to 1.015 indicating continued impairment of tubular function. The phenol-sulfonphthalein test was normal at the time. Electrocardiograms taken during the oliguric phase of the illness revealed no evidences of hyperkalemia.

**Treatment.**—An attempt to limit the total fluid intake to 1,000 cc plus the output was made, as shown in figure 1. Only 21 grams of sodium chloride was administered intravenously during the oliguric

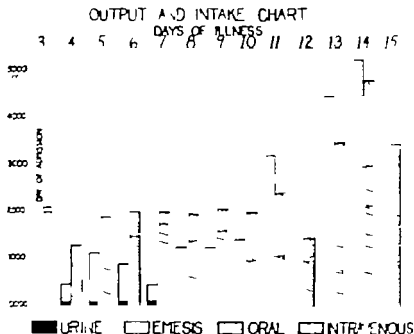


Figure 1

phase of the illness. The first 9 grams of sodium chloride was administered because of dehydration caused by vomiting. The second and third administrations were for the correction of presumed blood sodium deficiency, evidenced by low blood chlorides. The fourth dose given intravenously was to correct an episode of hypervolemia presumed to be dependent on the basis of azotemia. Sodium chloride intravenously was discontinued thereafter during the first days of acute uremia, with the patient remaining ill during

chris which was present on admission and as prophylaxis against intercurrent infection. Seconal suppositories were administered for sedation. The patient was put on a rice diet (Kempner) in addition to other carbohydrate foods. Orange juice because of its potassium content (even though low), was avoided. He did not tolerate solids or liquids very well until after diuresis had begun. Eight weeks after the onset of illness the patient was clinically well and had regained the 20 pounds he lost during the first 3 weeks of his illness.

### SUMMARY

A patient with lower nephron nephrosis following the inhalation of carbon tetrachloride fumes was treated conservatively and survived. An unusual feature of this case was the kidney enlargement as seen by roentgenograms. For the best results in carbon tetrachloride nephrosis one should bear in mind that the renal tubules return to function in about 11 days and the mortality of the disease is largely caused by (1) congestive heart failure arising from overtreatment and (2) hyperkalemia.

Because of the patient's lack of insight concerning the relation of carbon tetrachloride to the possible cause of his illness it is important to probe the history carefully.

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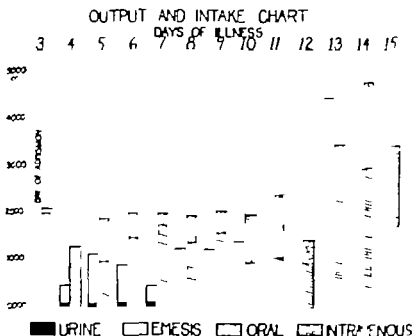


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Dextrose in 5 to 50 percent solution comprised the remainder of parenteral fluid. Parenteral vitamins in generous amounts and 1 cc of 10 per cent were given daily throughout treatment. Penicillin intramuscularly and aureomycin orally were given to combat the bron-

chris which was present on admission and as prophylaxis against intercurrent infection. Seconal suppositories were administered for sedation. The patient was put on a rice diet (Kempner) in addition to other carbohydrate foods. Orange juice because of its potassium content (even though low), was avoided. He did not tolerate solids or liquids very well until after diuresis had begun. Eight weeks after the onset of illness the patient was clinically well and had regained the 20 pounds he lost during the first 3 weeks of his illness.

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A patient with lower nephron nephrosis following the inhalation of carbon tetrachloride fumes was treated conservatively and survived. An unusual feature of this case was the kidney enlargement as seen by roentgenograms. For the best results in carbon tetrachloride nephrosis one should bear in mind that the renal tubules return to function in about 11 days and the mortality of the disease is largely caused by (1) congestive heart failure arising from overtreatment and (2) hyperpotassemia.

Because of the patient's lack of insight concerning the relation of carbon tetrachloride to the possible cause of his illness it is important to probe the history carefully.



# A Successful Embolectomy for a Saddle Embolus of the Abdominal Aorta

John J Wells *Captain, MC U S N (1)*

Edward V Dennen, *Captain, MC, U S N R (2)*

**A** SADDLE embolus of the bifurcation of the aorta is a dramatic vascular accident which a general surgeon might be called on to treat. The lower extremities do not withstand an oxygen lack as well as the upper extremities where collateral circulation is more abundant. Acute anoxia caused by the sudden lodgement of an embolus at the bifurcation of the aorta rapidly produces a necrotizing reaction in the endothelial lining of the blood vessels, vasomotor spasm, intra-vascular clotting, tissue acidosis, necrosis and gangrene. Some tissues of the body withstand anoxia for longer periods than other tissues. The brain can withstand an oxygen lack for not more than 4 or 5 minutes and recover; the kidneys 4 to 6 hours and the lower extremities 8 to 12 hours. Time therefore is an important factor in the management of a saddle embolus. The earlier an embolectomy is performed the greater is the chance of a successful result. With each succeeding hour that the operation is delayed the effects of anoxia and vasoconstriction are more pronounced and even though gangrene may not occur and an embolectomy be successful in saving the life of the patient the resultant muscular fibrosis, atrophy, impaired circulation and trophic skin changes are disabling late sequelae.

Virchow (3) first described arterial embolism. Labey (4) reported the first successful embolectomy for an embolus of the femoral artery.

(1) A U. S. N. val Hospital, St. Albans, Long Island, N. Y., at the time article was written; now at U. S. N. val Hospital, Portsmouth, Va.

(2) Consultant in General Surgery U. S. N. val Hospital, St. Albans, Long Island, N. Y.

(3) Virchow R.: Über die akute Entzündung der Arterien. Virchows Arch. f. path. Anat. 1: 272-378, 1847.

(4) Labey: Cited by Mosby M., and Dismont, N. J.: Embolie femorale a cours d'un frottement mitral post-arteriotomie guérison. Bull. Acad. d. méd. 66: 358-361, 1911.



Keeley (5) in reporting a successful case found 22 previously reported cases in which a saddle embolus at the bifurcation of the aorta was successfully removed.

TABLE 1—Site of lodgement of emboli affecting the limb (1)

Site	Massachusetts General Hospital	Cases reported by Key (2) (3)	Cases reported by Peutzger (4)	Cases reported by Dumas (5)
Subclavian artery.....	0	0	1 ( 0.7%)	2 ( 1.9%)
Axillary artery.....	9 ( 8.2%)	45 (11.8%)	10 ( 7.7%)	7 ( 5.4%)
Brachial artery.....	15 (13.6%)		10 ( 7.7%)	19 (14.7%)
Radial and ulnar arteries.....	0	1 ( 0.3%)	2 ( 1.4%)	1 ( 0.7%)
Aorta.....	15 (13.6%)	17 ( 4.3%)	12 ( 9.3%)	11 ( 8.5%)
Iliac artery.....	14 (12.7%)	66 (17.2%)	26 (20.1%)	23 (17.8%)
Femoral artery.....	40 (36.6%)	208 (54.4%)	57 (44.3%)	52 (40.3%)
Popliteal artery.....	15 (13.6%)	43 (11.3%)	10 ( 7.7%)	12 ( 9.2%)
Posterior tibial artery.....	2 ( 1.8%)	2 ( 0.5%)	1 ( 0.7%)	2 ( 1.5%)
Total.....	110	382	129	129

(1) Warren, R., and Linton, R. R. Treatment of arterial embolism. *New England J. Med.* 238: 421-429, Mar. 25, 1948.

(2) Key E. Über Embolektomie. In: *Behandlungsmethoden bei embolischen Zirkulationsstörungen der Extremitäten*. Acta chir. Scandinav. 54: 339-416, Jan. 1922.

(3) Key E. Embolectomy as treatment of circulatory disturbances in arteries. *Surg., Gynec. & Obst.* 36: 309-316, Mar. 23, 1923.

(4) Peutzger M. Über Embolektomie der Extremitätenarterien. (Eine Zusammenstellung aus 12 Fällen.) *Deutsche Zeitsch. f. Chir.* 210: 184-238, 1928.

(5) Dumas M. Arterial embolectomy. *Ann. Surg.* 98: 249-272, Aug. 1933; and 422-437 Sept. 1933.

The origin of the embolus in most cases is intracardiac from thrombi resulting from infarction and auricular fibrillation caused by rheumatic heart disease and arteriosclerotic and hypertensive heart disease. Emboli also originate from thrombosed pulmonary veins from atheromatous plaques in the aorta and from aortic aneurysms. The most common site of lodgement of an embolus is where large arterial vessels divide into their major branches such as the bifurcation of the abdominal aorta, the bifurcation of the common iliac artery, the division of the common femoral artery into the deep and superficial femoral arteries, the division of the popliteal artery into the anterior and posterior tibial arteries, and the division of the brachial and axillary arteries. In a study by Warren and Linton (6) of their experience with 98 patients who had 172 arterial emboli during the period from 1937 to 1946, the limbs were affected in the cases of 110 of these emboli. Warren and Linton compare the distribution of the sites of lodgement of these 110 emboli in their series with those in three other series as shown in table 1.

(6) Keeley J. L. Saddle embolus of aorta, report of successful embolectomy. *Ann. Surg.* 178: 252-253, Aug. 1948.

(7) Warren, R., and Linton, R. R. Treatment of arterial embolism. *New England J. Med.* 238: 421-429, Mar. 25, 1948.

*Embolism of the bifurcation of the aorta has an acute onset in about 90 percent of the cases. The pain is agonizing, it is located in the lower abdomen and radiates down both lower extremities. The femoral pulsations are absent but the aortic pulsation proximal to the site of embolus is generally forceful. The patient is in shock and has a motor and sensory loss in his lower extremities which are cold and pallid. In about 10 percent of these cases the onset is slower and in these the patient complains of a sensation of "pins and needles" in the lower extremities merging into pain which becomes more severe with each succeeding hour. The subsequent signs and symptoms depend on the size of the embolus, its propagation and the extent of distal arterial thrombosis.*

In this article a successful removal of a saddle embolus is reported.

### CASE REPORT

A 56-year-old man was admitted to this hospital in December 1948. His first previous admission had been in December 1947 at which time he complained of nervousness, insomnia and weight loss. Physical examination showed moderate bilateral exophthalmos, a diffuse moderately enlarged thyroid gland with a bruit, auricular fibrillation, and 1 plus ankle edema. The basal metabolic rate (BMR) was plus 38. He improved following the administration of digitoxin, propylthiouracil and barbiturates. The BMR came down to plus 22 and he was discharged to the outpatient clinic for follow-up prior to a thyroidectomy for hyperthyroidism. He was readmitted in January, August and November 1948 for recurrent cerebrovascular accidents of an embolic nature. His BMR varied from plus 16 to plus 22. His auricular fibrillation persisted and an electrocardiogram showed evidence of a chronic myocarditis on an arteriosclerotic basis. At the time of his admission in December 1948 he was mentally confused and had a left-sided hemiplegia.

In addition to a bilateral exophthalmos and a diffusely enlarged thyroid over which a bruit was heard, the patient had signs of left cardiac hypertrophy, an apical thrill and systolic murmur, a grossly irregular pulse and a blood pressure of 160/90. Neurologic examination revealed a right-sided facial weakness, protrusion of the tongue to the left and a left-sided hemiplegia with spasticity. A diagnosis of a cerebrovascular embolism on the basis of auricular fibrillation was made. In the 2 weeks following admission the patient became rational, the signs of his hemiplegia became minimal, and he became ambulatory.

On 29 December while lying in his bed he experienced a sudden agonizing pain in the lower abdomen which radiated to both thighs and legs. On examination both lower extremities were cold and pallid. The femoral and popliteal pulsations could not be felt. Oscillometric readings were negative. He complained of coldness of both lower extremities with a loss of sensation and motion. A diagnosis of a saddle embolus of the bifurcation of the aorta was made.

Three hours after the onset of symptoms under nitrous oxide-peritoneal anesthesia the abdomen was opened through a left lower rectus muscle-splitting incision. With the patient in moderate Trendelenburg position, the peritoneum and adventitia covering the aorta and iliac vessels were incised longitudinally from the level of the inferior mesenteric artery to below the bifurcation of the aorta a distance of about 35 cm. No pulsation was evident from 25 cm. proximal to the length of both common iliac arteries although the pulsations proximal to this segment were greatly exaggerated. The terminal 25 cm. of the abdominal aorta and both common iliac arteries were blue-gray and firm to palpation. The inferior vena cava and common iliac veins were separated from the abdominal aorta and common iliac arteries and the terminal 4 cm. of the aorta and the common iliac arteries were mobilized for a distance of 3 cm.

Rubber dams (1 by 6 inches) were placed around the abdominal aorta proximal to the bifurcation and also distally around each common iliac artery. The ends of each rubber dam were clamped with hemostats and *were used for traction and to control bleeding.* While slight anterior traction was maintained on the rubber dam placed around the aorta, a 1-inch longitudinal incision was made in the aorta over the site of the embolus and proximal to the bifurcation. A firm grape jelly-colored clot was manually expressed from the proximal aorta. No free bleeding was encountered. Suction was then applied using an L-shaped glass tube attached to a low-pressure suction pump and a clot was sucked from the aorta proximally. The spurting of blood which followed was controlled by anterior traction on the aorta. In a similar manner a 2 by 0.5 cm. Y-shaped clot was milked and sucked out of the common iliac arteries.

Before free bleeding was obtained from the left common iliac artery it was necessary to use both suction and the injection of normal saline solution. Free bleeding from the common iliac arteries was controlled by anterior traction on the rubber dam placed around the aorta and on those around each common iliac artery. The aorta was sutured with interrupted sutures of No. 00000 silk, using an atraumatic needle. The adventitia was closed with interrupted Lembert's sutures. Oxycel was placed over the suture line and the peritoneum and the abdominal wall were closed. On completion both femoral and popliteal arteries were pulsating strongly. The patient was given 50 mg. of heparin intravenously. During the operation, he received 900 cc. of whole blood. Postoperatively he was given continuous spinal analgesia through a Huber needle using 75 mg. of procaine repeated every 4 hours for 48 hours. Both lower extremities were wrapped in stockinet and a heat cradle was placed over the bed maintaining a temperature between 75 and 80 F. Seventy-five milligrams of heparin were given intravenously every 6 hours for 8 days. On the day of the operation the patient received 300 mg. of dexamethasone followed by 200 mg. on the first postoperative day. The daily dose of dexamethasone thereafter was adjusted to the daily prothrombin time. Both lower extremities remained warm and normal in color. The popliteal, dorsalis pedis and posterior tibial pulsations returned on both sides.

Three days after operation the patient was up in a chair. His recovery was uneventful and he was discharged on 21 April 1949 with excellent circulation in the extremities.

### DISCUSSION

A transabdominal approach to the bifurcation of the abdominal aorta provided adequate exposure of the site of the embolus and allowed direct vision and gentle handling of tissues in mobilizing the aorta and common iliac vessels so that anterior traction on the rubber dams placed around the arteries satisfactorily controlled bleeding. This approach also has the advantage of allowing the operator to perform a bilateral sympathectomy with very little time added to the operation. The bilateral removal of the third lumbar ganglion, which is easily exposed in the operative field, is sufficient. This further provides a more satisfactory sympathetic block to the lower extremities. Martin et al. (7) however have stated that a sympathectomy in arterial occlusion may have an untoward result because of the lessened blood flow caused by a lowered blood pressure immediately following operation.

A retrograde approach requires bilateral exposure of the femoral arteries. Removal of the large adherent clot found in this patient might have been more difficult by the retrograde method. The use of a cork screw or similar special instrument to dislodge the clot may traumatize the intima with subsequent thrombus formation. The retroperitoneal approach with dissection of the peritoneum upward to expose the retroperitoneal aorta and its bifurcation is advocated by many surgeons.

We followed the technic of Linton (8) which consists of (1) a direct peritoneal approach with adequate exposure (2) gentle handling of tissues (3) the occlusion of both common iliac arteries by traction before the aorta is opened in order to prevent the passage of clots distally as the clot is milked out of the aorta (4) avoidance of injury to the aortic intima by not using clamps or twisted tourniquets and (5) a bloodless field which permits accurate placing of everting sutures.

During convalescence and thereafter the patient received 600 mg. of dicumarol weekly in doses of 100 mg. daily for 6 days. The prothrombin time was determined weekly. In 4 months of this treatment the patient had no recurrence of embolism.

(7) Martin, W. B., Laufman, H.; and T. ell, S. W.: Rationale of therapy in acute vascular occlusions based upon microcirculatory observations. *Ann. Surg.* 129: 476-493, Apr. 1949.

(8) Linton, R. R.: Arterial embolism, simplified technique for removal of distal embolism at bifurcation of aorta with report of successful case. *Surg., Gynec. & Obst.* 80: 509-516, May 1945.



# Exposure (Open) Treatment of Burns<sup>(1)</sup>

Edwin J. Palanski *Lieutenant Colonel, MC U S A* (2)

Curtis P. Arta, *Major MC U S A.* (2)

Joseph R. Shaeffer *Colonel MC, U S A.* (2)

William E. Hackabee *Lieutenant, junior grade MC U S N R.* (3)

Richard C. Mitchell, *Lieutenant, junior grade MC, U S N R.* (3)

Joseph P. Russell, *Colonel, MC, U S A.* (3)

OUR interest in thermal burn injury was stimulated some time ago by the release of information revealing the overwhelming incidence of thermal burns in atomic warfare. Several thousands of burn casualties must be anticipated following explosion of an atomic bomb over any large city. With the possibility of such a catastrophe simplification of methods of treatment becomes necessary in the interest of economy of personnel and material. Anyone who has experienced the sudden influx of even six badly burned patients in a hospital can well appreciate the drain on supplies alone for the treatment of these patients with the currently standard pressure dressing method. With these considerations in mind, we began to study the effectiveness and practicability of the exposure principle of burn therapy which had been reintroduced in the British Isles by Wallace (4) about 2 years ago. The open treatment of burns was used in the United States at least 50 years ago and was discarded after the introduction of paraffin wax and ambrine treatment of burns in 1914 (5).

## PRINCIPLES OF TREATMENT

As in all technique of burn management, prevention and treatment of shock takes precedence over local therapy. Susceptibility to shock bears relationship to extent of injury. We have found it practical to

(1) Presented meeting of the Royal Society of Medicine London, 9 February 1951

(2) Surgical Research Unit and Surgical Service, Brook Army Hospital, Fort Sam Houston, Tex.

(3) Surgical Research Unit and Surgical Service, Tokyo Army Hospital

(4) Wallace A. B. Treatment of burn. Ann. Roy. Coll. Surgeons England 3: 283-300 Nov. 1949

(5) Blocker T. G., Blocker V. J. and Palanski E. J., Open treatment of burn therapy: history and present-day application. I. pre-

modify the Berkow scale for the purpose of making a quick estimate of total burn surface (fig 1). The body is divided into sectors all of which except the perineum, represent 9 percent of the body surface or multiples thereof as follows (6): head and neck, 9 percent; each upper

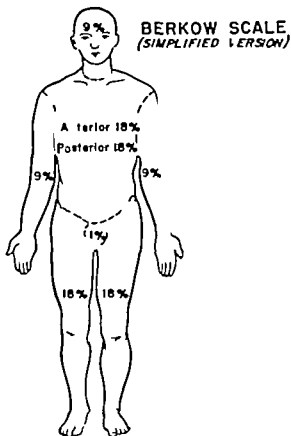


Figure 1—Rule of nines for estimation of extent of body surface area burned.

extremity 9 percent; each lower extremity 18 percent; anterior and posterior trunk 18 percent each; perineum, 1 percent. The extent of body burn determines blood and electrolyte solution requirements which are given according to formulations designed to maintain a urinary output of from 40 to 60 cc per hour (6) (7). Cannulation of a vein for fluid replacement is desirable in order to obtain accurate measurements of

(6) Cape O and Moore F D. R distribution of body water and fluid therapy of burned patients. *Am Surg* 125:1010-1045 Dec. 1947

(7) Parrell, O J and Eva E L. Fluid and electrolyte requirements in burns. Presented at Symposium on Burns, National Research Council, Washington, D C., 2-4 November 1950

the urinary output, we prefer to catheterize any patient with a burn of more than 25 percent of the body surface

Next to maintaining the patient's fluid and electrolyte balance prevention of infection is of the utmost importance because the threat of infection is present until the wound has healed. The pathways of infection in burns include the burned tissues and surrounding intact skin as well as the unprotected hands and respiratory tracts of patient and attendants. Infection is the important factor in converting partial burns to full-thickness burns. The purpose of cover over a burn surface is to block exogenous pathways of infection. The purpose of exposure is to prevent contamination from becoming wound suppuration. It is based on the principle that bacteria cannot tolerate drying and sunlight. Furthermore, pabulum for bacterial growth is reduced to a minimum by meticulous excision of all loose or detached epithelium and gentle cleansing of the burn surface. The natural antibacterial properties of exuding plasma, enhanced by antibiotics, assist in eliminating residual microorganisms. In patients receiving penicillin intramuscularly we have measured up to 1 unit of penicillin per ml of exuding plasma. Topley and associates (8) have demonstrated aureomycin in excess of 1 microgram in burn exudates of patients treated with 250 mg of aureomycin by mouth every 6 hours. The drug levels achieved are bacteriostatic for most hemolytic streptococci and hemolytic coagulase-positive micrococci which commonly predominate the bacterial flora of recent burns.

Coagulation and drying of the exudate over a period of from 24 to 72 hours results in the formation of a tough eschar which in turn protects the burns from further contamination. Rest or avoidance of movement, as well as other trauma and elevation of extremities to minimize edema are factors of influence in promoting rapid formation of this eschar. Absorptive dressings achieve the same ends in a different way.

#### THE EXPOSURE (OPEN) TREATMENT OF BURNS

The purpose of this article is to report our experience in a clinical trial of the exposure method in 131 patients (table 1), with particular emphasis on (1) types of patients suitable for exposure treatment, (2) problems of application of the method and (3) its advantages and disadvantages. Sixty-five were hospitalized in Brooke Army Hospital and were seen mostly within from 1 to 24 hours after injury. The other 66 were injured in Korea and were seen at Tokyo Army Hospital on an average of  $4\frac{1}{2}$  to 7 days after injury. The management was the same in both groups. Clothing or dressings are removed preferably using aseptic precautions as soon as the patient is seen and gross dirt is washed off the injured area with large quantities of warm water with the addition of some detergent such as hexachlorophene or with a bland white soap which is also satisfactory. All blisters are opened and all detached epithelium is removed. Cleansing and debridement are

(8) Topley E.; Lowbury E. J. L. and Harst, L. Bacteriological control of aureomycin therapy. *Lancet* 1: 87 1951



performed with a minimum of trauma to the surviving epithelium. If the patient has been burned recently morphine given intravenously provides sufficient analgesia. If the burn is older light general anesthesia is usually necessary. Three thousand units of tetanus antitoxin and 600 000 units of aqueous procaine penicillin G are given intramuscularly on admission. The same dose of penicillin is given daily for an additional 4 days and thereafter only for a specific indication. After debridement, the patient is placed in a bed in the position which best exposes the affected side. Sterile sheets are not necessary.

TABLE I—Details of exposure treatment / 131 burn patients

	Brook Army Hospital (65 patients)	Tyng Army Hospital (66 patients)
<b>Patients with full-thickness burns</b>		
Body area burned		
Less than 10% —————	10	16
10-20% —————	9	9
Over 20% —————	5	3
Day of exposure* —————	1	7 3
Day of graft* —————	24	19
Deaths** —————	4	0
<b>Patients with partial-thickness burns</b>		
Body area burned		
Less than 10% —————	31	28
10-20% —————	6	7
Over 20% —————	4	3
Day of exposure —————	1	4 9
Day of healing —————	13.5	14.3

A range

\*One death—accidental burn following syncope due to exsanguinating hemorrhage from peptic ulcer. Three deaths—81%, 60%, and 37% full-thickness burns.

If the patient is in shock on arrival, he is placed between clean sheets and treated intensively for shock. Debridement is postponed until the general condition has improved. The success of the method depends largely on how effectively complete exposure, relative immobilization, and elevation can be achieved.

**Elevation.**—Elevation of the extremities prevents additional edema by aiding the return of venous blood to the heart. Conversion of a partial-thickness burn to a full-thickness burn is thereby avoided. Burns of the configuration which provide an unburned area on which to rest for weight bearing present no special problem. If the feet and ankles are not involved, the leg and thigh can be elevated by resting the ankles on several pillows. In this manner circumferential burns of the lower extremity up to mid thigh can be treated satisfactorily by exposure. In burn involving the hand we believe that most patients can be encouraged to lie in bed with the elbows flexed and hands elevated. It is of paramount importance that the wrists be kept in a position of flexion with the metacarpophalangeal joints in flexion. It is highly

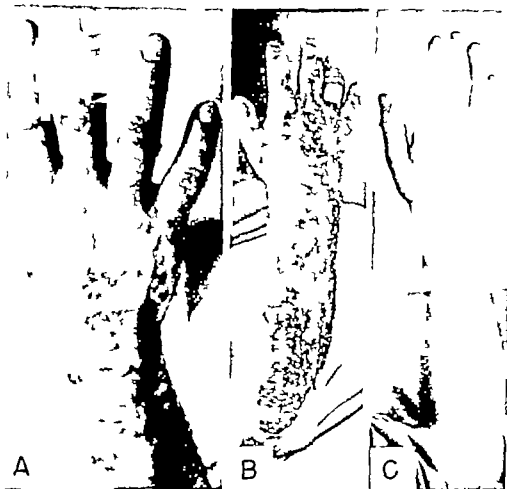


Figure 2.—(A) Partial thickness burn immediately after injury (B) Appearance of arm and hand 7 days later. A dry plasma crust protects the injured surface. (C) Appearance at time of discharge 14 days after injury

desirable to have the crusts form with the hand in this position. Figure 2 shows a typical result. For circumferential burns involving the upper arm and upper thigh exposure in our experience has not been altogether satisfactory particularly when other regions of the body also were burned.

*The trunk.*—Burns involving only one side of the trunk are managed satisfactorily by the exposure method but circumferential burns pose a real problem. We have treated some of these by placing the patient on one side until complete crust formation has taken place. The patient was then turned and a crust allowed to form on the other side. This regimen leaves much to be desired, particularly if the upper extremities are also burned, because the crust frequently cracks and thereby invites infection. Problems inherent in closed methods of treatment of the buttocks area are largely eliminated by exposure and our results have been good. Figures 3, 4, and 5 show typical results.



*Figure 3 —Partial-thickness burn caused by lifting lid off can of boiling water. Appearance following cleansing and exposure 6 days after injury.*



*Figure 4 —Same patient as figure 3 on fifth day of exposure. Crust well formed.*



Figure 3 — Same patient as figure 3 at time of discharge 25 days after admission (19 days after starting exposure treatment)

*The head.*—In general this method of treating burns of the face has given gratifying results. If the eyelids are involved, contracture is a serious threat. Irritation of the cornea caused by inability to effect complete closure of the lids, corneal ulcers and, finally ectropion may occur. Tarsorrhaphy performed early will frequently prevent these complications and, in the deep burn will provide optimal conditions for early grafting and correction of the deformity. With burns of the neck hyperextension and relative immobilization are important for uncomplicated crust formation.

In the uncomplicated case a crust forms in from 24 to 72 hours. A warm environment will delay the formation of a crust, and cold appears to hasten it. A good crust is dry and completely painless. Spontaneous desquamation of the crust over partial-thickness burns generally occurs between the eighth and sixteenth days. The average healing time for partial thickness burns is 14 days after beginning exposure treatment. In mixed partial and full thickness burns the crust tends to remain firmly adherent in the full-thickness areas. We have usually delayed excision of crusts until the twenty first day after burning and never later than the twenty fifth day.

#### DISCUSSION

Partial-thickness burns up to 30 percent of body surface and involving predominantly one side of the body are particularly suited for treatment by exposure as are burns of the head and buttocks. If the regimen

as outlined above is adhered to these types of burns heal with a minimum of discomfort to the patient and minimal nursing assistance. Loss of weight and debilitation are less frequently observed. Particularly striking is the observation that suppuration is uncommon and that the characteristic odor associated with infection in burns becomes hardly detectable. In consequence conversion by infection to full-thickness skin loss rarely occurs. The opportunity afforded by daily critical inspection of the burn crust forewarns against threat of infection in cracks with the result that suppuration, if it occurs, can be prevented from becoming diffuse. On the basis of our experience particularly in Tokyo Army Hospital, we now regard 1 week after injury as the upper limit of applicability of the exposure method. It cannot be overemphasized that a granulating wound is unsuitable for treatment by exposure.

Several aspects of exposure treatment warrant comment. Care and ingenuity are required to obtain free exposure to all of burns of complicated distribution. Cooperation of the patient is essential. An uncooperative patient, adult or child, will frequently defeat the principle of treatment by undue movement, soaking of the crust by incontinence and the like. Patients are particularly susceptible to draft and often complain of chilliness the first day or two after exposure. Curiosity is another problem and it affects physician and nurses as well as patients and their visitors. It is a great temptation to become impatient with the natural rate of separation and to lift off the eschar. When this is done newly laid down epithelium is pulled off with it, bleeding ensues and contamination which is often followed by infection, is the result. The temptation is less if no separation occurs, curled up freed crusts are trimmed.

In our hands circumferential burns of the trunk have shown evidence of infection because either the crust became cracked or it failed to form completely. To date we have no solution to this problem. In a few instances contraction of the crust over full-thickness burns of the extremities has given rise to ischemic pain. Crusts over the chest may at times interfere mechanically with respiration and require incision.

Finally results obtained with the exposure method, as with any other method, bear a direct relationship to the thoroughness with which details of treatment are carried out.

### CONCLUSIONS

Although the experience with the exposure treatment of burns at Brooke Army Hospital and Tokyo Army Hospital has been generally satisfactory it is not possible at this time to assess fully the value of the method for all types of burns under all conditions. This method however does appear to be highly satisfactory for burns confined to one side of the body and for burns involving the head, neck or perineum.

# Mandibular Ostectomy

## A Case Report

Richard J. Burch *Lieutenant Colonel, U S A. F (DC)*

**A** 19-YEAR-OLD soldier came to the dental service of Percy Jones General Hospital in December 1949 seeking treatment for severe malocclusion and congenital prognathism (figs 1 and 2). In 1946 he had become aware of inability to masticate food and of overdevelopment of the mandible. In the year preceding his examination in the clinic he had lost about 25 pounds in weight. No other members of his immediate family had a similar condition.



*Figure 1 —Preoperative appearance of patient.*

**Examination** —The oral tissues were normal in color and tone. The teeth were in fairly good position in the arches but there was no functional occlusion (fig 3). The tips of the upper right and left cuspids



*Figure 2.—Preoperative roentgenogram.*



*Figure 3.*

were in point contact with the lower teeth in the resting position. There were no teeth distal to the left second mandibular bicuspid. General physical findings were essentially normal. Full mouth lateral plates of the hard and soft tissues, postero-anterior roentgenograms and maxillary and mandibular study models were made.

*Preoperative treatment*—In preparation for a bilateral mandibular ostectomy, upper and lower models were duplicated and mounted on the articulator. The mandibular model was sectioned and by trial position it was determined that for optimal occlusion 1 cm. should be removed



Figure 4.

from the left side immediately distal to the second bicuspid and 0.8 cm. from the right side at the site of the first molar.

*Operation.*—The patient was admitted to the oral surgery service of the hospital on 3 February 1950 and the intraoral procedure was performed on 4 February under premedication, procaine block and infiltration anesthesia. On the left the soft tissue was elevated and the lingual and cortical plates cut with the surgical bar well down the mandible at a predetermined point (fig. 4). The right mandibular first molar was removed and the cortical cuts were repeated through the socket area (fig. 5). The soft tissue was returned to position and sutured. The patient was given penicillin for 1 week postoperatively.





Figure 5

Five weeks later a cast labiolingual appliance was inserted on the maxillary teeth and fixed with interproximal pins. New impressions were then taken and models were made and mounted on the articulator. The lower model was sectioned, repositioned and restored with stone. The left side was relieved to allow for the excess of soft tissue which would result from the second operation. The repositioned lower model was then waxed for the splint in open bite position and processed in acrylic. A contoured arch bar was fixed to the lower anterior teeth by direct wiring and a gold crown with buccal lug was cemented on the right second mandibular molar.

On 14 March the extraoral procedure was completed under gas oxygen-ether nasal intratracheal anesthesia. A bilateral mandibular block with procaine and epinephrine was given to aid in hemostasis prior to the induction of anesthesia. The inferior border of the right mandible was exposed through a 3.5 cm. incision 1 cm. below the inferior margin and the periosteum elevated to expose the cuts in the cortical plate. The section of the cortical plate was completed with surgical bur. Holes for direct wiring were made through the anterior and posterior segments 0.5 cm. from the fracture lines with a bibeveled bur. The buccal cortical plate was then sectioned over the nerve canal and the lower bone section removed after completing the fracture manually with an osteotome. The upper portion of the bone section was then removed without damage to the neuro-arterial sheath. The sheath was not centric in position but was found lying directly on the lingual

cortical plate. Because of the unusual density of the cancellous structure, recesses in each segment to accommodate the vessels, length of the neuro-arterial sheath were cut with a mallet and . . . The bone segments were then approximated with a No. 00 suture and the soft tissues closed without drains. The procedure was repeated on the left side. Dressings were applied and the oral cavity was inserted with intermaxillary elastic traction.

**Course**—During the operation the patient was given 500 cc of blood followed by 500 cc of 5 percent dextrose in water intravenously and was given 1 000 cc of 5 percent dextrose in water intravenously after his return to the recovery ward. He was also given 100 000 units of penicillin every 3 hours and codeine sulfate was used as needed to control mild postoperative pain. On the day following the operation 1 000 cc of 5 percent dextrose in saline solution with 250 mg of ascorbic acid and 250 mg of thiamine added was given intravenously. Again on 17 March 1 000 cc of 5 percent dextrose in saline solution with 250 mg of ascorbic acid and 100 mg of thiamine was given intravenously. The patient had a mild postoperative edema and required little sedation. By the third postoperative day he was taking ample quantities of a high caloric liquid diet. The results following removal of intermaxillary fixation and the splint are shown in figures 6 7 and 8.



Figure 6.—Postoperative roentgenogram.



Figure 7

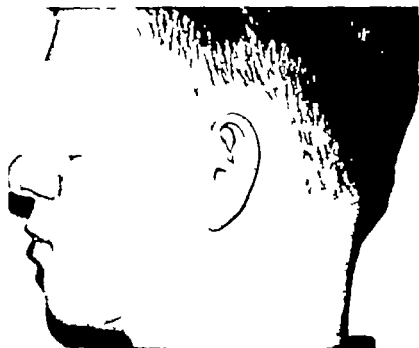


Figure 8.—Postoperative appearance of patient

Comment.—The patient gained 6 pound during the 9 weeks healing period and the fibrous union was unusually strong for that length of time. He diet averaged 4 000 calories daily and was carefully supervised in both preparation and ingestion.

# Duplication of Acrylic Dentures

Richard F. Tuma, Command, DC U

**T**HERE are many laboratory procedures for the rebasing and duplication of acrylic dentures containing porcelain teeth. All of these procedures with slight variations are basically the same and each has its own undesirable features such as (1) the large percent of error in transferring the teeth from a plaster matrix to a finished waxed model, (2) the patched appearance of the denture caused by the line of union of the materials and (3) the difficulties encountered in cleaning the impression material from the denture base while in a flask to allow the curing of new material on the old denture base. Recently we have tried a different technic which has proved highly successful.

The procedure is as follows. Clean all the stain from the teeth of the old denture with a rag wheel and pumice. Remove all undercuts from the old denture. Using the denture as an impression tray take an impression. Pour a model in the old denture and do not separate the denture from the model. Invest the denture and the model in a denture flask in the usual manner using stone as the investment. Separate the flask in accordance with the usual procedure for the impression material. Trim the periphery of the cast as in preparation for processing any denture. All gross impression material should be removed from the old denture base with a knife or scraper. Place the half of the flask containing the old denture in a large inlay furnace and heat slowly at about 550° F until the acrylic is thoroughly softened. Remove the flask from the furnace with tongs then grasp the acrylic material with pliers and pull from the mold. An occasional tooth that pulls loose from the mold can be replaced when the flask has cooled. Allow the mold to cool and remove any impression material that has adhered to the stone. Paint the mold with any separating material and proceed as in packing a new denture.

This technic is speedy and greatly reduces the percent of error as compared to other methods of duplication. No equipment is needed other than that usually found in a dental prosthetic laboratory. The denture does not present a patched or repaired appearance.

(1) U. S. Naval Station, Green Cove Springs, Fla.



# Military Preventive Medicine<sup>(1)</sup>

## A Keystone of Military Strength

James Stevens Simmons *Brigadier General, U S A (Ret.)* (2)

**I**F I were starting my military career today I should like someone to give me a clear picture of the objectives of the Medical Service of the Army and to indicate the main channels through which the Medical Service and all its personnel can work most profitably for the achievement of these objectives. I would want this type of orientation to help me in shaping my own philosophy and all my future actions as a military surgeon.

### THE MISSION OF THE MEDICAL DEPARTMENT

Briefly stated the responsibility of the Medical Service is to keep the soldier on his feet and fit to fight. This is a big order and the achievement of this mission requires broad leadership, clear vision, careful planning and aggressive action by a great variety of specialists. The major approaches to the accomplishment of this mission are clinical and preventive.

*The clinical approach* is to organize adequate personnel and facilities with which to salvage the sick and wounded and restore them to health. A modern army must provide effective first aid and rapid evacuation for the wounded. It must have modern facilities adapted to combat conditions so that the sick and wounded will receive the best possible medical care and hospitalization. This must be followed when feasible by modern rehabilitation to restore the soldier to a state of physical and mental fitness in the shortest possible time. To accomplish this important portion of the Medical Service's mission requires an enormous organization and large numbers of specialists in every aspect of curative surgery and curative medicine.

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(1) Presented before the class in Military Medicine at the Army Medical Service Graduate School, Army Medical Center, Washington, D. C., 21 February 1951.

(2) Dean, Harvard School of Public Health.

*The preventive approach* to the conservation of fighting manpower is the even greater obligation of the Medical Service to protect as many soldiers as possible against sickness or injury. This more constructive approach is made through the numerous activities now included under the term military preventive medicine. From the viewpoint of military efficiency it is more desirable to keep the well soldier well than to provide the expensive and complex facilities required to restore the sick soldier to health. For this reason disease prevention should logically be the primary objective of the Medical Service.

It is therefore important that every member of the military establishment—not only the personnel of the Medical Service but all members of the combat arms—should adopt the preventive attitude toward disease. Every soldier should keep in mind the basic truth that a ounce of prevention is worth a pound of cure, and he should be familiar with the basic principles that can be applied for his protection against disease.

According to a newspaper announcement several weeks ago, an epidemic of typhus was raging among the Chinese troops in Korea. Such a report 10 years ago would have caused us much concern. Today there is no reason for alarm because we are armed with effective preventive measures developed in the last war with which American troops can be protected against this ancient scourge. We now have an effective typhus vaccine and an even more effective louse powder. This incident serves to point up the practical importance of military preventive medicine today. It also emphasizes the fact that this young specialty is not static but is vigorous, rapidly growing, and has infinite possibilities for further development. This is important because the nation now faces the most serious threat of its entire existence. We must immediately take steps to strengthen our total health defenses in order to conserve both fighting and working manpower.

Since 25 June 1950 the Armed Forces have been faced with the problem of maintaining the health of our troops fighting in Korea and at the same time planning for the prevention of disease among the large forces now being mobilized and trained to meet the threat of a third global war. The civil population is faced with the equally difficult problem of strengthening its program of preventive medicine and public health to conserve industrial manpower and to operate the expanding health departments required for civil defense. It is therefore important to make stock of the nation's total health facilities—both military and civilian—in order to make sound plans for the present emergency.

### MILITARY PREVENTIVE MEDICINE

The aim of preventive medicine is to prevent physical and mental disease. In civilian medical schools the term preventive medicine is commonly restricted to the prevention of disease in the individual. The term public health is applied to the prevention of disease and the

conservation of health in communities or other large aggregations of people such as States or nations. Military preventive medicine applies to large groups of fighting men and therefore it is comparable to civilian public health. Since the beginning of history every intelligent military leader has been aware of the hazards of disease and has realized the need for some method which would protect his troops against sickness. This was true even of the barbarians who reluctantly abandoned their sick and wounded fighting men on the battlefield.

An early example of an attempt to do something about the American soldier's health is afforded by an order issued by General Washington at Peekskill in the Revolutionary War entitled "Instructions for Soldiers in the Service of the United States Concerning Means of Preserving Health." At that time there was no knowledge concerning the transmission of infectious diseases and these instructions emphasized cleanliness, camp hygiene, and the disposal of feces. These activities are still important to good health, but we now know that they are not enough to prevent disease. Therefore it is not surprising that General Washington's troops were decimated by numerous epidemics. Conditions were no better in the War of 1812, the Mexican War, or in the Civil War. The commanders and medical officers of those early days must have been deeply frustrated at their inability to control the diseases which have always accompanied war.

*Development of basic knowledge*—In the period following the Civil War the foundation for preventive medicine was laid. From 1860 to 1900 the medical discoveries of Pasteur, Koch, and Lister and their associates and followers produced a great reservoir of specific knowledge about many of the micro-organisms which cause disease. It is fortunate that during that time a member of the Regular Army Medical Corps, George M. Sternberg, became interested in the potentialities of these new discoveries. Having served in the Civil War and having seen the crippling effect of the military diseases of that period, he knew that they could not be controlled by any method available at that time. Excited by the promise of these new discoveries, he undertook pioneer studies in the newly emerging sciences of bacteriology and protozoology and discovered the pneumococcus. He published the first American textbook on bacteriology in 1884, and he was later referred to by Robert Koch as the "father of American bacteriology."

Sternberg served as Surgeon General from 1893 to 1902 and during this period he initiated an extensive program of research in military preventive medicine. Following the bitter experience of our troops with typhoid, dysentery, and yellow fever during the Spanish-American War, he organized special Army research boards for the study of diseases in our newly acquired tropical possessions. His broad vision made possible the important researches of Major Walter Reed on yellow fever in Cuba—researches which influenced the later work of General Gorgas on sanitation in Panama. It led to Colonel Ashford's studies which



showed that malignant Puerto Rican anemia was caused by massive hookworm infestation. This was followed by the world-wide hookworm control program of the Rockefeller Foundation. It provided for the investigations of Colonel Strong on dysentery, plague, cholera and other tropic diseases in Manila; the researches of Colonel Craig on malaria in the Philippines and elsewhere; and for the work of Colonel Siler and others on dengue. It undoubtedly influenced the later work by General Darnall who gave to the world improved methods for the chlorination of city water supplies; and the researches of General Russell who developed the triple typhoid vaccine which has been used successfully by the Armed Forces in two world wars. Sternberg's broad concept of the importance of preventive medicine influenced all of these contributions. It also stimulated other Army, Navy and civilian workers to conduct researches along similar lines which have added much to the development of both military and civilian preventive medicine.

As evidence of General Sternberg's leading role in the country's medical and health activities of his time, it is noteworthy that he served as President of the American Medical Association and as President of the American Public Health Association. He was also a pioneer educator in the new field of military and civilian preventive medicine. When he became Surgeon General in 1893, one of his first acts was to organize the Army Medical School in Washington to provide facilities for research and for postgraduate education of medical officers with special emphasis on prevention. It was not until 16 years later (1909) that the first formal department of preventive medicine was established in any civilian medical school (Harvard) in this country.

### MILITARY HEALTH IN THE TWENTIETH CENTURY

Since 1900 there has been a progressive improvement in military health which has paralleled closely the advances in civilian medicine and public health. During World War I both the Army and Navy had well organized programs of preventive medicine and their health records were much better than in previous wars. Typhoid which had been serious threats even as late as the Spanish-American War was well controlled. The most important causes of sickness and death were pneumonia, influenza and other respiratory diseases. There was little exposure to tropic diseases.

In the 20 postwar years of peace, public health in this country made still further advances. Just before World War II the crude death rates for the United States had decreased from 17 per thousand in 1900 to about 10 per thousand in 1940. The expected life span at birth for an American citizen had increased from about 46 years to about 65 years. Although the preventive health of our troops stationed in permanent posts in the United States was better than that of the average nonmilitary citizen, this is generally true because (1) the military forces are made up largely of vigorous young adults who have been carefully se-

lected (2) the American military man's way of living including his personal hygiene diet housing, and physical training is regulated (3) he is immunized against smallpox typhoid and other infectious diseases to which he may be exposed and (4) he lives in a carefully sanitized environment which is rigidly controlled by a well organized Medical Service

## PREVENTIVE MEDICINE PROGRAM IN WORLD WAR II

The hardships imposed by field service and combat make it difficult to maintain this type of peacetime health protection under the conditions of war. Therefore when it appeared that the United States would be drawn into World War II, the Surgeon General of the Army began to plan the expansion of the Medical Service to meet the increased responsibility of mobilization and war. The situation was somewhat like that faced today but in 1940 we were not so well prepared for war as we are now. Although at that time the total Medical Service of the Regular Army consisted of only a few thousand officers by the end of the war it had expanded to more than 100 000 officers and several hundred thousand enlisted men—a medical force which was larger than the entire Regular Army prior to the war.

Convinced of the importance of disease prevention to the accomplishment of his mission the Surgeon General placed primary emphasis on the development of a strong aggressive wartime program of military preventive medicine. This program was planned by the preventive medicine service in his office in Washington and the directors of preventive medicine in the major theater headquarters. It was put into action by Medical Service personnel in all the far flung places where our troops served. Its effectiveness can be attributed to the cooperative action of the 10 million military persons who carried it out.

*The preventive medicine service*—In 1940 the Surgeon General started in his office a formal organization which eventually became the preventive medicine service. It began with one officer and expanded rapidly until it became a major unit of his staff. By 1944 this service consisted of the following divisions: (1) medical intelligence (2) epidemiology (3) venereal disease control, (4) tropical disease control, (5) laboratories (6) sanitation and hygiene (7) sanitary engineering (8) nutrition, (9) occupational health and (10) civil public health. The chief of the service also organized the Board for the Control of Influenza and Other Epidemic Diseases in the United States Army and the United States Army Typhus Commission. This Board composed of more than 100 civilian consultants to the Surgeon General was divided into 10 special commissions each of which was concerned with a specific problem of disease control. It was later called the Army Epidemiological Board and has now become the Armed Forces Epidemiological Board. The U S A Typhus Commission which was a

joint Army Navy and Public Health Service organization was administered through the Secretary of War

The broad objective which guided this service in all its planning was to use every possible facility in the nation—military and civilian—to keep the soldier well. To attain this objective it was necessary to apply all of the scientific information available to the prevention of disease and the conservation of military health and to promote research to discover and develop more effective control methods. In accomplishing this the preventive medicine service enlisted the help of many highly qualified experts—at home and abroad—and it arranged for the assistance of numerous governmental and civilian agencies.

The Army's preventive medicine program included (1) general measures used to safeguard the soldier's health, (2) measures employed to protect him against specific diseases and (3) the extensive research activities carried on in looking for better methods to control the diseases that might attack him. Although some of these activities were planned and supervised by divisions of the Surgeon General's office not formally included in the preventive medicine service they were part of the total program.

*General health measures* included the physical selection of healthy recruits the provision of healthful clothing housing nutrition and physical training; intensive training in hygiene and sanitary control of the soldier's environment. The latter was handled cooperatively by the division of sanitation and hygiene and the division of sanitary engineering. It included providing for safe food and water supplies for the sanitary disposal of wastes and the control of many insect vectors and rodent reservoirs of disease. The importance of sanitation was emphasized in the training courses of all military personnel and special intensive training in the subject was provided for the Medical Service in the Medical Field Service School at Carlisle Barracks. The sanitary program was operated efficiently especially in fixed installations but it was difficult to maintain adequate sanitation under combat conditions and the filth-borne diarrheas and dysenteries and certain insect-borne disease especially malaria caused much sickness in certain overseas locations. In the continental United States this program was relatively successful. The extensive work done by the Army in its camps and posts was supplemented in the surrounding civilian areas by sanitary programs operated through the U. S. Public Health Service by State health departments. This cooperative arrangement which was initiated by the preventive medicine service in 1940 was of great importance. It produced results which have had a profound influence on the present status of civilian and military health in the United States.

*The origin of malaria in the United States*—A spectacular example afforded by the present status of malaria. In 1940 the Army started an intensive program for the elimination of mosquitoes in all

military installations in this country. At our request the U S Public Health Service supplemented this program with an extra military mosquito control campaign. The Army program cost about 17 million and that of the U S Public Health Service about 19 million dollars. Considered as a whole this was the most extensive mosquito-control program ever operated in any country in the history of the world. It was highly effective and although millions of men were trained in camps located in the Deep South relatively few soldiers contracted malaria in this country. An important postwar outgrowth of this joint program was the establishment of the Communicable Disease Center with headquarters in Atlanta, Ga. which is continuing the fight against malaria and other diseases and is now helping to mobilize our extra military defenses for the present emergency. It is reassuring to know that malaria which once was a major affliction in the South is now disappearing. Last year the State of Mississippi offered a bonus of \$10.00 any doctor who could find a new case of malaria and not one case was reported. This story of the conquest of malaria in the United States is only one example of how the preventive medicine program of World War II exerted a powerful effect on the postwar health of the nation.

*New insecticides*—Another outstanding contribution made by the department of sanitation and hygiene was the initiation and coordination of an extensive research program aimed at the development of more effective agents and methods with which to improve military hygiene and sanitation. One of the most helpful results of this work was the development of new wartime insect repellents and insecticides which have been used so successfully for the control of typhus, bubonic plague, dengue, malaria, and other important diseases. The story of the development of these new agents is a romantic tale of military achievement. Thousands of studies were made in many laboratories scattered all over the country but the initiation, coordination and general guidance of the entire program of research and development was carried on in the division of sanitation of the Army preventive medicine service in Washington. The wartime development of DDT alone has been worth more than the total cost of the Army's entire research program during the war. DDT was the greatest contribution of the war not only to military but to civilian health. It has freed us from the fear of typhus and it is now being used to conquer malaria even in the tropics.

*Prevention of specific diseases*—In addition to these general health measures the Army's preventive medicine program included other activities designed to protect the soldier against specific diseases. The following divisions of the preventive medicine service were concerned with this phase of the problem: medical intelligence, epidemiology, laboratories, venereal disease control, and tropical disease control. They were assisted by the Army Epidemiological Board and by the Typhus Commission. The coordinated work of the members of these five divisions, the Board and the Commission was concerned with

(1) the collection of exact information about the diseases that might attack American troops in any part of the world (2) the analysis of current disease statistics (3) the maintenance of adequate diagnostic and health laboratories for the identification of disease-producing organisms (4) the development of policies (5) recommendations for quick action to control threatened outbreaks of disease and (6) the initiation of medical research in the laboratories and in the field to develop more effective control methods. Through these activities the Surgeon General was kept informed at all times of the incidence of disease in our troops and in civil populations throughout most of the world. This enabled him to make intelligent plans for the protection of the troops.

*Immunization*—Theoretically the ideal method for the specific control of infectious diseases would be through immunization. Although only a limited number of effective immunizing agents have been discovered, those that are available have contributed much to the maintenance of America's fighting manpower. A conference of representatives of the Army, Navy, and U. S. Public Health Service held early in 1940 in Washington recommended active immunization against smallpox, typhoid, the paratyphoid fevers, and tetanus. It also recommended that immunization against certain diseases including diphtheria, Rocky Mountain spotted fever, plague, and cholera be used only when needed to meet local conditions. Later other immunizing procedures were adopted for use under special conditions, as for example, the vaccines against epidemic typhus and yellow fever, both of which are considered effective. Experimental work also was done to develop vaccines against the dysenteries, the various types of encephalitis, influenza, et cetera. We still do not have a useful vaccine against the dysenteries; the vaccines against encephalitis and influenza still require improvement to meet the needs of the Army.

*Occupational hazards and health*—The division of occupational health included branches dealing with (1) the health of workers in Army-owned industrial plants (2) industrial hazards and accidents (3) toxicology and (4) the hazards of operating tanks and other mechanized Army transportation. This division initiated and supervised the activities of the Army Industrial Research Laboratory at Johns Hopkins University and the Armored Forces Research Laboratory at Fort Knox.

*Civilian health in occupied countries*—The civil public health division was concerned with plans to protect the health of the civil population of conquered or liberated countries insofar as this influenced military activities. Throughout World War II this division worked closely with the medical intelligence division and with the War Department. It planned for the development of strong postwar civil health programs in Germany and Japan and it assisted in selecting much of the key personnel to work in these areas.

## THE CONTROL OF DISEASES IN WORLD WAR II

The filth-borne gastrointestinal diseases which include the typhoid fevers the dysenteries and diarrheas and cholera have long been the scourge of armies operating in the field. During World War II, however none of these diseases were important except the diarrheas and dysenteries which did cause much temporary illness in certain locations overseas.

The wartime prevalence of the acute respiratory diseases including influenza and pneumonia was higher than during the peacetime year from 1930 to 1940 but lower than the rates for World War I. The mortality from these diseases was greatly reduced undoubtedly by the widespread use of the sulfonamides and later penicillin.

All our previous wars have been accompanied by a great venereal disease among troops and in the civil population. Venereal diseases have plagued armies since the beginning of time. A disabled American troops since the battle of Bunker Hill. A program for the control of venereal diseases was commenced in this country and in certain locations abroad. In previous wars there was a definite reduction in these diseases; they are by no means under adequate control and they still remain an important unsolved problem for the future.

The tropical diseases were another important hazard because so much of the fighting was done in the Tropics. This had been anticipated by the Surgeon General and for years military medical officers had been urging that more studies be made to discover better agents with which to protect troops in the field against tropical diseases. In addition to the insecticides previously mentioned researches were directed at the discovery of an effective prophylactic drug for field use against malaria. Millions of dollars were spent in the search for new compounds which could be given to the soldier in the field to kill malarial sporozoites at the time of their injection by the bite of the mosquito. Although the ideal prophylactic has not yet been found, this research program proved to us that quinine when properly used, will prevent falciparum but will only suppress vivax malaria. More important it led to the discovery of a number of new antimalarial drugs. Some of these are highly effective for treatment in the clinical case and others for example chloroquine are more useful than quinine for suppression.

Although malaria was well controlled in this country it was an important cause of illness in certain overseas locations especially in the early part of the war. There were almost 500 000 admissions to hospitals during the war and the rate was 18.9 per thousand per annum. These figures included many admissions for relapses. They do not give a true picture of the number of men infected as many cases were suppressed or cured by the routine use of quinine. Over 80 percent of these patients with clinical malaria were admitted to hospitals.

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overseas. Those treated in this country were largely relapses from infections contracted abroad. In general the treatment was excellent and the death rate was not significant.

There were many other important tropical diseases including dengue, filariasis and schistosomiasis, but none of these was as important as malaria. The tropical skin diseases were a serious problem in many places; this problem is still unsolved. There were various other disease problems, some of which still need attention, such as infectious hepatitis, the neurotropic virus infections and trench foot. Considered as a whole, however, the health of the Army in World War II was much better than during any previous war. There were no great epidemics and many of the former plagues of war were completely controlled. In brief, the results show that within half a century military preventive medicine had advanced to the point where it paid rich dividends in the conservation of America's fighting manpower.

In the Spanish-American War the rate for deaths from disease among our troops was about 25 per thousand per annum; 13 American soldiers died of disease to every 1 killed in battle. In World War I the rate was reduced to about 16; the ratio of disease to battle deaths was 1:1. In World War II the disease death rate for our total Army of about 10 million men was only 0.6 per thousand per annum; in the European Theater only one soldier died of disease for every 85 killed in battle. This experience of the recent past shows that the field of preventive medicine and public health now has at hand methods which can be used to conserve both civilian and military manpower.

#### UNSOLVED PEACETIME HEALTH PROBLEMS

As we face the present national emergency it is important to realize that in spite of the progress already made many health problems must be solved if we are to conserve the nation's manpower in preparation for the threat of a long war. Even under the peacetime conditions of the last few years too many civilians have been incapacitated or killed by preventable disease and accidents. The death rate for infectious diseases has been reduced but they are not yet under control. The mental and degenerative diseases cause an enormous national loss in money and manpower. Other unsolved problems include occupational and industrial hazards and diseases, nutritional deficiencies, poor housing, atmospheric contamination, pollution of our streams with sewage and industrial wastes, and the need to conserve and protect the national water supply. There is much room for improvement in the field of maternal and child health; this was shown by the large number of physical and mental defects found in young men examined by the draft boards during the last war. Of those examined since June 1950 to bring the Armed Forces up to three and one-half million, one million have been rejected as physically, mentally or morally unfit.

## NEW DEFENSE HEALTH PROBLEMS

In addition to these unsolved peacetime civilian problems we must also consider the new disease hazards of a modern war which might easily begin with an atomic attack on the United States and require the use of American troops both in this country and abroad. This means that both the civil and the military population must be prepared for the occurrence of unusual diseases which might accompany sabotage and bombing and the disasters produced by atomic, biologic or psychologic warfare. It also means that the civil health agencies must be prepared to combat a variety of diseases many of which are now considered under control. In addition the Armed Forces must be prepared to meet the wartime diseases which undoubtedly will be encountered in military operations. The existence of so many unsolved health problems at this late date in our national development is disappointing and that although we Americans boast about health we still lack adequate health protection and that we still are not utilizing our resources for the prevention of disease. Therefore if we are to provide and maintain the healthy manpower essential to the present emergency and for the infinitely greater demand for health care indefinitely long time in the future we must organize a stronger defense health program.

IMPORTANCE OF PREVENTIVE MEDICINE IN THE  
DEFENSE PROGRAM

Our defense program must provide for both curative and preventive medicine. It is logical, however, even in peacetime to place the greater emphasis on preventive medicine in order to decrease expensive hospitalization and medical care. In time of war there is an added need to keep well people well because the entire population is needed for active duty either on the home front or in the fighting line. This means the new program must be aimed primarily at prevention. If our country is to make the most of its latent preventive facilities the importance of preventive medicine must be re-emphasized. Every one in the field of medicine and public health should make it his business to know what needs to be done to prevent disease in this country and regardless of his primary specialty he should work unselfishly for the accomplishment of this objective. If all our 200,000 American physicians will apply the principles of preventive medicine to the families of their patients and give enthusiastic support to their community health programs if all of the country's hospitals will accept the added responsibility of serving as real health centers for their communities with a view to keeping the people well and if sufficient health agencies manned by adequate numbers of competent specialists are provided for the entire country the physical, mental and moral fiber of the nation can be enormously strengthened.



# Acute Lateral Ankle Sprains Treated by Sural Nerve Block<sup>(1)</sup>

James B. Hutchison *Lieutenant junior grade MC U S N R.* 1

SINCE the publication of an article (2) on local procaine injection in the treatment of sprained ankles many physicians (3) (4) (5) have successfully used this technic. It is thought that the local injection of procaine inhibits the autonomic nervous stimulation at the sensory nerve endings in the injured tissue thus preventing the vasodilatation and diffusion of fluids that in turn further stimulate these nerve endings. The purpose of this article is to describe an improved method of procaine injection in the treatment of acute lateral ankle sprains. To date this method has been used on nine patients and the results have surpassed those obtained in a larger number treated by local injection directly into the injured area after the method of Leriche (2). This method of treatment was developed after it was discovered that injection of procaine into the sural nerve in acute ankle sprains gave excellent results and without the occasional recurrence of acute pain in the area 3 or 4 hours following direct injection in and around the sprained ligaments which is believed to be caused by trauma added to the soft tissues by the multiple needle punctures.

## TECHNIC

A point about 3 inches above the external malleolus and over the posterolateral border of the fibula is chosen for the injection. The surrounding hair and skin are prepared for injection. A skin wheal is

(1) Norfolk Naval Shipyard, Portsmouth, Va.

(2) Leriche R., and Froelich, F: *Traitement de certaines fractures articulaires par les infiltrations de novocaïne et la mobilisation active immédiate* *Presse med.* 44: 1665-1666, Oct. 24, 1936.

(3) McLaughlin, C. W., Jr.: *Novocain infiltration in treatment of acute ankle injuries without fracture.* *Surgery* 20: 280-283 Aug. 1946.

(4) McMaster, P. E.: *Treatment of ankle sprains observations in more than 500 cases.* *J. A. M. A.* 122: 659-660 July 3 1943.

(5) Alexander H. H., Jr.: *Treatment of sprained ankle* *Am. J. Surg.* 50: 581-584 Dec. 1940.



## COMBAT

Whereas we began World War II with no specific plan for the care of neuropsychiatric casualties we now have definite plans and directives (15) (16) (17) (18) to enable us to treat neuropsychiatric combat casualties effectively and thereby prevent excessive losses in manpower. Principles employed are (a) treatment as far forward as possible (b) centralization of screening treatment and evacuation and (c) treatment under other than a hospital atmosphere. In combat areas the formation of special treatment units by the use of mobile psychiatric (16) teams attached to clearing companies or numbered hospitals as indicated is authorized. The principles of combat psychiatry treatment of combat casualties and the legal aspects of psychiatry in military law (19) have all been published in appropriate Army publications.

## PSYCHOLOGY

Clinical psychology has been firmly established in the Army Medical Service as a branch in the Psychiatry and Neurology Consultants Division. Procurement is proceeding satisfactorily under the terms of the senior psychology student program (20) whereby Army internships with a later period of obligated service are offered to those pursuing Doctorate degrees in universities.

## SOCIAL WORK

Since the end of World War II psychiatric social work has been formally established as a specialty in the Army Medical Service and as a branch of the Psychiatry and Neurology Consultants Division. Officer procurement is proceeding satisfactorily under the terms of a graduate social work student program (21) whereby recent graduates in psychiatric social work take a competitive year's tour of duty with the Army. Lately the program has been expanded to include all social casework services for all Army medical installations and the branch has been redesignated as the Social Services Branch.

## PSYCHIATRY AND NEUROLOGY

With the demobilization incident to World War II few trained psychiatrists or neurologists remained on duty in the Army. Approved residency training programs (22) (23) were established in military

(15) Combat Psychiatry Bull. U. S. Army Dept (supp.), p. 216, Nov. 1949

(16) Neuropsychiatric Casualties of Operations JC 6, Apr. 1950.

(17) Report on S. & P. Psychiatry Forces M.

J. 11 1379-1397 Dec 1950

(18) T/O&E 8-500 Mar 1950

(19) TM 8-240 Sept. 1950 P

(20) SR 605-60-40 May 1949 U

(21) SR 605-60-42 Sept 1949 O

(22) SR 605-60-43 J 1950

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(23) SGO Cir No 9 J M

Program.

established in appropriate Army directives including the functions of the Theater Psychiatrist, Army Psychiatrist, Division Psychiatrist, Training Center Psychiatrist, and Disciplinary Barracks Psychiatrist. We have a consultant in psychiatry assigned on a theater level in the Far East. We have no Army psychiatrists assigned either to field armies or Army areas in the continental United States but we do have division psychiatrists in each active overseas combat division. A mental hygiene clinic has been established in each of our 9 basic training centers (there were 33 during World War II) and there are adequate staff in each of our 3 disciplinary barracks. In our hospital service psychiatry has been established as a service comparable to medicine and surgery wherever the numbers of patients so warrant and local definitive treatment is given as far as the professional capacity of the staff permits.

### REPORTS

One of the great defects in the past has been the lack of effective communication on psychiatric problems from field medical units and between responsible staff officers in the different echelons of command. Then necessary Army regulations permit more or less direct communication on technical matters (10). In addition periodic reports such as the External Technical Medical Data Reports (11), monthly report from the Mental Hygiene Consultation Services (5), and monthly reports from the Psychiatry and Sociology Division in Disciplinary Barracks (12) received from field commands.

### CLASSIFICATION AND ASSIGNMENT OF NEUROPSYCHIATRIC PERSONNEL

Whereas during World War II we had military occupational specialty (MOS) numbers only for neuropsychiatrists and later on psychologists we now have MOS numbers also for the electroencephalographer, the behaviorist psychiatrist, psychiatric social worker, psychiatric nurse, and mail and TAC (13) (14) enlisted specialists such as neuropsychiatric technician, psychological technician, psychiatric social work technician, and electroencephalographic technician. There are 31 enlisted career fields (Army wide), of which the medical is only one and there are 33 enlisted medical specialties. School courses in military psychiatry and in the other medical occupational specialties are either in operation or are being maintained on a standby basis at Brooke Army Medical Center.

(10) AR 340-15 Jul 1950 Correspondence and Mail.

(11) SR 47-1905-1 Sept 1949 Medical Service—External Medical Data Report.

(12) SR 605-975-10 Mar 1949 Personnel—Monthly Statistical Report of Disciplinary Barracks.

(13) SR 615-25-30 Nov 1950 Enlisted Personnel—TAC MOS Assignment and SR 615-25-15 Nov 1950 Enlisted Personnel—Military Occupational Specialties.

(14) SR 615-25-27 Nov 1950 Enlisted Personnel—Career Fields.

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(15) Combat Psychiatry Bull. U. S. Army M. Dept. (supp.), p. 216, Nov. 1949.

(16) Neuropsychiatric Casualties, Handling in Theater of Operations, TC 6, Apr. 1950.

(17) Ranson, S. W. Psychiatric treatment in combat areas. U. S. Armed Forces M. J. 1: 1379-1397 Dec. 1950.

(18) T/O&E 8-300, Mar. 1950 Medical Service Organization Dept. Army.

(19) TM 8-240 Sept. 1950 Psychiatry in Military Law.

(20) SR 605-60-40 May 1949 Officers—Senior Psychology Student Program.

(21) SR 605-60-42, Sept. 1949 Officers—Graduate Social Work Student Program.

(22) SR 605-60-43 Jan. 1950 Officers—Medical Officer Procurement, Professional Training Programs.

(23) SGO Cir. No. 9 Jan. 1951 Medical Service Graduate Professional Education Program.



hospitals and officers were assigned to designated civilian hospitals for residency training. In this manner well over 100 additional officers with psychiatric training have been secured for service in the Army. Without this training and without the services of these officers the high quality of medical service that has been rendered in the last few months would have been impossible. We have 16 or more Regular Army officers certified in psychiatry or in neurology or both.

### INDUCTION

In general, physical and mental (psychiatric) standards have been lowered to include personnel formerly designated a "limited service" (24) (25). Inasmuch as there are now no formal limited service categories this has led to certain difficulties in the classification and assignment of men. Physical standards for a Reserve commission in the Army Medical Service have been lowered to equal those for enlisted personnel to avoid the possibility of physicians being inducted on an enlisted level but not being eligible for a commissioned status. Intelligence requirements for induction have, however, been set at a higher level than that prevailing in World War II. In part this has been caused by the desire to create (1) a cadre or training Army and (2) because in the Army the incidence of delinquency and of venereal disease occur in inverse ratio to intelligence level. It is believed that any pressure to accept large numbers of substandard personnel should be exerted across the board to include all the Armed Services and not be directed solely at the Army.

### SEPARATION

In former years those who were unable to perform military service were largely separated through medical channels. During and since World War II increased recognition has been given to other factors contributing to inability to perform satisfactory service such as motivation, morale, and emotional and personality disorders, all of which contribute to ineffectiveness and may be more properly handled through administrative procedures (26) (27) (28) (29) (30) (31) (32). Physical qualifica-

(24) AR 45-115 Aug. 1948, Medical Service—Physical Standard and Physical Profile for Enlistment and Induction.

(25) AR 45-100 Jan. 1951, Medical Service—Standards of Miscellaneous Physical Examinations.

(26) AR 615-364, June 1950, Enlisted Personnel—Discharge Dishonorable and Bad Conduct.

(27) AR 615-366, Oct. 1947, Enlisted Personnel—Discharge Misconduct.

(28) AR 615-368, Oct. 1948, Enlisted Personnel—Discharge Laches.

(29) AR 615-369, Oct. 1948, Enlisted Personnel—Discharge Incompetence or Unreliability.

(30) AR 615-370, Dec. 1950, Enlisted Personnel—Discharge Disloyal or Subversive.

(31) AR 600-443 12 J. 1950, Personnel—Separation of Homosexuals.

(32) AR 605-200 Jan. 1951 and Memo 605-200-1 24 Jan. 1951, Officers—Demotion and Elimination.

tions for retention on active duty are liberally interpreted (33) (34) (35) (36). Persons may be retained provided that such diseases, injuries, or infirmities are (1) of such a nature and degree as not to affect adversely the performance of continued active duty considering the soldier's age, grade, branch, and normal duties and (2) not subject to complications or serious aggravation by reason of continued active duty. Thus no disorder by name is an absolute bar to continued military duty. Consequently the number of administrative separations has increased markedly and the rate for medical separations has been below normal expectancies. The noneffective rate for illness has been lower in the last few years than at any other time in the Army's history. Of marked benefit too has been the change in retirement laws whereby both officer and enlisted personnel can be retired on percentage of disability—rather than at a fixed percentage of pay.

### PREVENTIVE PSYCHIATRY

Much greater emphasis has been given to intensive treatment for mental disorders and emotional and personality problems through mental hygiene clinics, outpatient services and individual treatment based on dynamic psychiatry. The services of a diagnostic treatment team have been used wherever possible employing the services of psychiatrists, clinical psychologists, psychiatric social workers and psychiatric nurses as well as occupational therapists, physical therapists and others trained in techniques of rehabilitation. On the other hand increased recognition has been given to the influence of social factors in the production of mental illness with specific attention to the stresses and supports (37) (38) (39) that are encountered in the military service. Factors especially considered are combat, the environment, physical hardships, proper classification and assignment, training systems, replacement systems, the rotation system, domestic situations, personnel policies that emphasize the importance of the individual (40), leadership unit and group identifications, religious influences, orientation, education in mental health, attitudes, incentives and motivations.

### USE OF MEDICAL PERSONNEL

The training program undertaken by the Army was designed to meet specialist requirements within a 10-year period. In the interim various

(33) AR 600-450, 7 Nov. 1949 Personnel—Separation for Physical Disability.

(34) SR 600-450-1, 7 Nov. 1949 Personnel—Physical Evaluation, Hospitalization, Disposition, and Separation for Physical Reasons.

(35) SR 615-360-40, 25 Aug. 1950, Enlisted Personnel—Disposition of Individuals with Physical or Mental Disability EPTE.

(36) SR 600-440-1, 7 June 1949 Personnel—Disposition of the Psychotic.

(37) AR 15-120, 30 July 1950, Boards, Commissions and Committees—Character Guidance.

(38) AR 355-20, 23 Jan. 1951, Troop Information and Education—Troop Information Program.

(39) AR 355-3, 23 Jan. 1951 Troop Information and Education—General Provisions.

(40) Statement of Military Personnel Policy, Section III, Bulletin No. 4, Department of the Army, 14 March 1950.

measures have been used to overcome specialist shortages as well as to maintain a close relationship between military and civilian practice. To this end, the civilian consultant system has been used to overcome specialist shortages as well as to maintain a close relationship between military and civilian practice. Under emergency conditions in which the needs of the Army become vastly greater, an expansion of the consultant system helps but does not fully satisfy the need. The Organized and Active Reserve was designed to fill the needs of the Army for increased personnel in time of emergency. For various reasons this personnel has not been readily available in the last several months. A reorganization of the entire Reserve program is currently under study.

#### SUMMARY

In the last few years a flexible organizational structure for neuropsychiatric services in the Army has been largely completed by translating concepts evolved during World War II into firm Army doctrine and directives. The main problem before us at present is the procurement, training, and effective use of personnel.

# Mirror Laryngoscopy

Harry R. Morse *Lieutenant junior grade MC U S N R* (1)

**M**ANY patients with laryngeal complaints who have never had their larynx visualized or who have not had the procedure early enough are seen. Although the examination of the larynx with a mirror is a simple procedure which requires little time it is often neglected. Any physician can make a competent laryngeal examination with a little practice. With the apparent increasing incidence of carcinoma of the larynx (2) and the possibility of cure with early diagnosis mirror laryngoscopy should be more commonly used by all physicians especially general practitioners.

The correct technic is discussed in most of the textbooks on otolaryngology. Jackson and Jackson (3) call attention to such pitfalls as failure to (1) make a thorough examination (2) develop a routine so that no significant findings will be overlooked (3) realize that the larynx of any patient of any age whose mouth can be opened can be visualized and (4) visualize the anterior commissure. By adhering to the rules listed in the next paragraph visualization of the anterior commissure is possible but in a small number of subjects an epiglottic retractor may be needed.

The following requirements must be met.

(1) The patient should be seated well back in the chair with the head and shoulders forward and the chin extended (figs. 1 and 2).

(2) A mirror which is small enough to fit between the tonsils without touching them thus decreasing the patient's tendency to gag should be used.

(3) The mirror should be warmed to body temperature before use. It may be held either in the examiner's right or left hand.

(4) The tongue should be grasped between the thumb and third finger with a folded piece of gauze the thumb being on the upper surface of

(1) U. S. Naval Hospital, National Naval Medical Center, Bethesda, Md.

(2) Jackson, C., and Jackson, C. L. *Diseases and Injuries of the Larynx*, 2d edition, revised. The Macmillan Co., New York, N. Y., 1943.

(3) Jackson, C., and Jackson, C. L. *Diseases of the Nose, Throat, and Ear*. W. B. Saunders Co., Philadelphia, Pa., 1945.



Figure 1—The correct position for examination.

the tongue thus liberating the index finger to hold the upper lip out of the way.

(5) Gagging should be controlled by skill. If the subject is gagged deeply through the mouth, if this does not suffice a small amount of local anesthetic may be sprayed on the posterior pharyngeal wall. Either 2 percent pentocaine or 4 percent cocaine is effective and quite safe.

(6) Having the patient phonate will frequently be helpful in obtaining better or a more complete view.



*Figure 2.—Incorrect position for examination.*

By observing the above principles examination of the larynx will be easy. Many physicians fail to make mirror examinations because they have not developed dexterity with the head mirror. To obviate this difficulty mirrors with a built-in light source are available. I have recently devised such a mirror with medium-sized flashlight batteries contained in the handle (fig. 3). This has proved to be convenient for examination of the larynx and also quite practical not only when the examiner lacks skill with the head mirror but also for use in the home at the bedside or when carrying out special procedures requiring topical anesthesia of



Figure 1—The correct position for examination.

the tongue thus liberating the end finger to hold the upper lip out of the way.

(5) Gaging should be controlled by leading the subject to breathe deeply through the mouth. If this does not suffice a small amount of local anesthetic may be applied on the posterior pharyngeal wall. Either 2 percent pontocaine or 4 percent cocaine is effective and quite safe.

(6) Holding the patient phonetic will often result in obtaining better or a more complete view.



*Figure 2.—Incorrect position for examination.*

By observing the above principles examination of the larynx will be easy. Many physicians fail to make mirror examinations because they have not developed dexterity with the head mirror. To obviate this difficulty mirrors with a built in light source are available. I have recently devised such a mirror with medium-sized flashlight batteries contained in the handle (fig. 3). This has proved to be convenient for examination of the larynx and also quite practical not only when the examiner lacks skill with the head mirror but also for use in the home at the bedside or when carrying out special procedures requiring topical anesthesia of





Figure 3.—Portable laryngeal mirror with battery contained in handle.

the larynx is inserted and protrusion of bronchoscopic end tip of laryngoscope. The mirror can be easily and quickly removed from the position and sterilized by boiling. The battery handle can be removed to permit introduction of the rest of the instrument.

# Method for Dental Technician Candidate Selection

The Value of the Intelligence Quotient and Practical Aptitude  
Tests as an Accurate Index of Potential Abilities

Carliss W. Schantz, *Captain, DC, U S N* (1)

**D**URING the current year 20 million elementary school children will be subjected to some form of intelligence test to determine their intelligence quotient (I. Q.). In little more than a generation the influence of intelligence tests has risen to a new height and has become empirical in the field of education as a yardstick to determine when a child should read, whether another should go to college and if a third would grow up to be a dolt or an Einstein. This manner of testing intelligence has spread into practically all fields of education including the Armed Forces service schools. In theory intelligence tests are sound. Because intelligence is the faculty used by human beings to perform tasks motivated by the mind it is assumed that intelligence tests can measure that faculty in an individual. And yet, while thousands of educators continue to apportion the attention allotted a pupil in accordance with the score made by him in a 45-minute written examination more and more practical educators are beginning to doubt the infallibility of such tests.

In the case of dental technicians field observation of students whose I. Q. had not been very high at the beginning of training periods has reversed the popular opinion that such students would always make inept or stupid technicians. The fault may lie in the type and scope of the usual tests which in only a few instances measure potential aptitude. Records of dental technicians covering the experience of 2 years and including case histories of 400 men and women revealed that when certain factors were considered weighed and evaluated in determining aptitude and intelligence the usual intelligence tests proved to be inadequate. The factors which proved to be most valuable in testing technician applicants were (1) personality (2) character (3) social

(1) U S. Naval Dental Technicians School, U S. Naval Training Station, Great Lakes Ill.

attitude (4) physical development, (5) common sense (6) ability to find facts and to apply them for practical purposes and (7) experience (and education).

The prevailing tendency of all intelligence tests devised to date does not consider the economic and social group from which the student comes. Instead the average grade made by a average group plus five is established the normal level of all persons who later take such test. The result, assessed on such a basis invariably places the student with an I. Q. above the average in a higher bracket when, in reality such a rating may have been the result of greater advantage in economic and social background rather than higher intelligence. A specific example on problem in popular test requires that the student know the meaning of the word so that. Among students from higher socioeconomic groups 8 percent gave the correct answer while only 28 percent of students of the same age group from lower groups answered it correctly. That is a matter of education and experience rather than of intelligence.

In the selection of dental technicians the basic requirement is a minimum of 2 years of high school or its equivalent. A more desirable prerequisite is 4 years of high school because these candidates are better grounded in elementary sciences and have learned to study and can be more easily motivated. In selecting students with the minimum requirement as well as those with higher educational qualification some consideration of their experience in the dental field is given. The applicant who offers equivalent experience in lieu of high school training (1) is acutely conscious of difficulties in expression, especially expressions on in writing (2) has finer skill and co-ordination but does not make good typist and (3) has a strong desire to overcome his lack of education. The selected student begins the training on the varied native abilities. This imposes on the instructor the task of providing assimilable instruction to each of the student regardless of his educational background. To offset known shortcomings many instructors in their inability to project and properly motivate students enter the on-service training course with undervalued and perhaps the instructor. In order fully to qualify the instructor and to prevent any lack of ability on his part to provide all students with the same assimilable material highly qualified monitor and instructor provided for the on-service program audited all instructors classroom work. Despite the correction of obvious shortcomings of the instructors failures on the student level were found at the same level (6 percent). This does not necessarily indicate that no value was derived from the instructor service course but rather that the method of evaluation is not really as reliable as we shall fully particularly from the viewpoint of the instructor. It is on his conclusion it was deemed desirable to apply pilot techniques for the student and to test the present minimum educational requirement.

The test was devised in order to provide the instructors with an index to the student's known abilities. Additional factors were sought for immediate potential progress evaluation. It was desired to know whether the student (1) could read correctly and follow written instructions (2) could apply written instructions and correctly interpret them as related to a blueprint, (3) possessed manual dexterity (4) was unduly emotional and (5) reacted quickly to stimuli.

The following instructions were given each candidate with the necessary visual aids and instruments.

### APTITUDE TEST FOR DENTAL TECHNICIANS (DEXTERITY TEST)

#### *Read These Instructions Carefully*

You have been supplied with one piece of chalk which is 4 inches long and 1 inch in diameter. One end, it will be noted, is flat and the other end is cone-shaped.

You further are supplied with a pencil ruler, plaster knife and a file. With these tools you are to carve two kinds of figures: a half sphere and a triangle as denoted in the attached blueprint.

It is most important that you follow the directions for each carving very carefully. You should do as neat work as possible for you will be graded on such points as:

1. Degree to which your surfaces are flat and smooth.
2. Degree to which angles are clean-cut.
3. Degree to which rounded surfaces are symmetrical.
4. Similarity of finished object to the blueprint and description, or accuracy of reproduction.

No deduction from grade will be made if the finished carving possesses pencil marks but the carving should NOT be marked or marred with knife cuts to designate dimensions, etc.

#### *Suggestions*

Your knife is very sharp and if you handle the knife properly you will note that you can slice the chalk easily in the direction you draw the blade leaving a smooth glasslike surface. A slight angle on the blade as desired may be regulated by your grip on the knife handle. The grip applied to the knife handle should exclude the thumb. The thumb serves best as a guide to the surface being carved and as a fulcrum for control.

You can use the file for outline shaping with the ruler to test accuracy of measurements and flatness of surface by placing the ruler on the carved surface in several positions.

It is important to remember that inasmuch as this is an aptitude test for dexterity and carving, use only the tools provided. You are not to use sandpaper or attempt to use bench surfaces or your hands to smooth the chalk.

All illustrations have been drawn to scale and all dimensions are indicated. Follow directions carefully and remember you will be graded according to your result rather than reproduction of the scale of the carving.

You are allowed 45 minutes to complete your test. Try NOT to take longer than 45 minutes.

*Completion Procedure*

1. Write your name and service number on your carving in pen ink.
2. Hand in your finished carving to your examination proctor.
3. Result of this examination will be forwarded to you within 10 days by your commanding officer.

With the above instructions each student was supplied with a blueprint of his project as a visual aid and a guide for shape and dimensions (fig. 1).

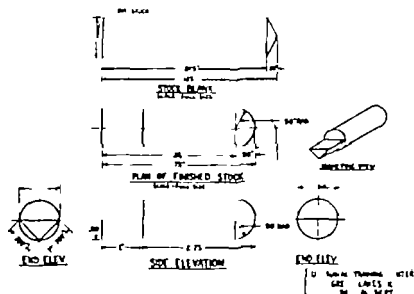
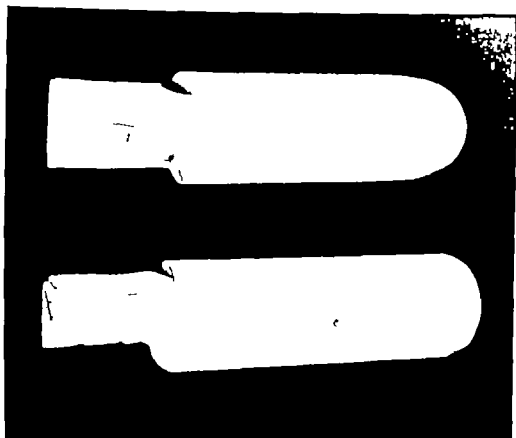


Figure 1—Blueprint furnished with written instructions.

## RESULTS

As a result of the test the students were rated as outstanding (will develop), and below average (may develop but will require longer period of instruction). Figure 2 shows an example of outstanding and below average aptitude. The students completing the below average carving failed the prescribed course. To check the development of dental technicians after their graduation (6-month industrial pituitary check sheets are devised and forwarded to field service). The return check sheets were then checked against the pilot test. Evaluation of the reports of 200 graduates indicated that early estimate made by means of the pilot test were most accurate and helpful in selecting the most potential candidates for dental technician rate. Inevitably the percentage from the average group improved and in the judgment of the dental officer who has had opportunity to observe the practical application of the technicians' studied qualities the graduate of this group is qualified to advance in rate.



*Figure 2.—Student submitting upper carving was rated outstanding; lower carving, below average*

### CONCLUSIONS

The figures compiled and the facts indicated by the foregoing findings would appear to prove that present methods of evaluation of a candidate's aptitude are inadequate and that additional methods are both desirable and necessary. They would be of particular value where in a curriculum of limited time attempts are being made to adjust differences in natural ability, education, socioeconomic background and varying experience to give an equal chance to all students.

*Completion Procedure:*

1. Write your name and service number on your carving in pencil.
2. Hand in your finished carving to your examination proctor.
3. Results of this examination will be forwarded to you within 10 days via your commanding officer.

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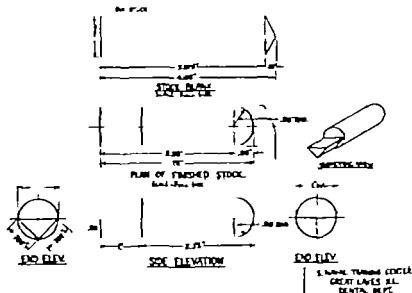
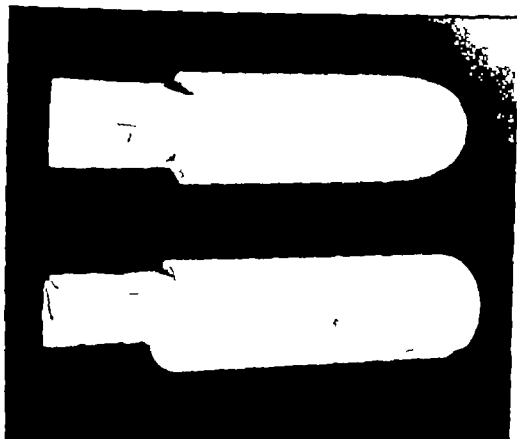


Figure 1—Blueprint furnished with written instructions.

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## Residency Information Service

The Council on Medical Education and Hospitals of the American Medical Association is sponsoring a Residency Information Service. A statement concerning this service appears in the 21 April 1951 issue of the Journal of the American Medical Association. All hospitals approved for residency training are being asked to furnish information periodically concerning the residencies offered by them. This information is to be compiled revised monthly and made available to any prospective applicant on request beginning on or about 1 May 1951.

—The Editors

# About the Army Medical Service

## Procurement of Medical Officers

Paul I. Robinson, *Brigadier General MC, U S A.* (1)

THE ideal Regular Army prospect is the capable efficient Reserve officer on active duty whose ambitions are recognized whose assignment is proper whose efforts are appreciated and whose welfare is protected. A person under these conditions is generally happy at work. The responsibility for bringing about these conditions is not that of the commanding officer nor that of the personnel officer alone. It is the apparent responsibility of every Regular Army officer regardless of his position or assignment. When an officer is working under the above conditions he is happy and his morale is high.

High morale may be said to be the reflection of the success of an individual's superior officer in fulfilling his leadership responsibilities. High morale knows no class segregation; it has no bias or prejudice based on false standards of civilization; it arises from a person's feelings of acceptance and of belongingness in a group. It stems from efficiency from consideration and human relations and from the feeling of equity.

The pattern of equity and equality within a group does not exclude us from the fact that we may feel that we as individuals belong to another exclusive group which may be part or parcel of a smaller or larger group. For example we may sit around a table and discuss medicine each one in the group coming from a different university. We all have a share within the discussion of the matter of medicine; however one may feel that he came from a superior medical school. Though one may feel that the standards of other medical schools were not up to those of the school which he attended this does not in any way exclude him from equity within the group. This metaphor may be applied to the Army. We in the Regular Army feel that we belong to a group but this does not exclude us from equity with any other member of the military service.

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(1) Chief Personnel Division, Office of the Surgeon General Department of the Army

We in the Regular Service do however have the responsibility of telling others of our organization what we feel to be the benefits of a Regular Army career. On the other hand we should not enforce such an attitude upon the person who has reasons for manifesting no interest whatsoever in the Regular Army Medical Service.

We now have a procurement goal of approximately 700 officers for the Regular Army Medical Corps. Slightly over 700 officers have been selected for the Regular Army in the past 30 months on a crage of 23 a month. This number in itself does not appear to be large however when it is considered that the selection is based upon a highly competitive process it may be understood that the 700 officers elected make a highly impressive figure. Goals for other Regular Corps in the Army Medical Service are Dental Corps 120 Medical Service Corps 225 Women's Medical Specialist Corps 240 and the Army Nurse Corps about 1500. The Veterinary Corps is up to strength at the present time.

Our particular interest in personnel today must be the procurement of officers who vitalize and enrich our Regular Army Medical Service. Reserve officers on active duty at the time of application for Regular Army status simply complete the necessary forms and forward them to the Army Surgeon General through their Commanding Officers. If the applicant is in civilian status he completes the necessary forms and sends them to the named Army Hospital (2) nearest his residence. The application forms may be obtained by writing to the Army Surgeon General Washington 25 D. C. or the Commanding Officer of any of the named Army hospitals (2).

Qualitatively we believe that we have within the Regular Army Corps of the Medical Service the finest possible cross-section of medical personnel of our nation. Our immediate and future problem is to maintain high standards in the interest of the Army and the officers who now comprise the Corps.

Adequate machinery now exists for the integration of nonregular component Medical Service officers into the Regular Army. There are of course areas to be improved and constant efforts toward improvement will continue. We are relying on every Regular Army officer to assist in the procurement of personnel to fill the existing vacancies in the Regular Army Medical Service.

The professional, social, and financial benefits of the service are now well recognized and may be truthfully exploited.

One phase of military service which has in the past had little if any recognition is that of research and development within the field of medicine and in the field of the sciences allied to medicine. The

(2) Hospitals such as Letterman, Fitzsimons, Walter Reed, et al., which are under the jurisdiction of the Office of the Surgeon General, differentiated from U. S. Army Hospitals (Class I installations) under the jurisdiction of the Commanding Officer of the post on which located.

great increase in the number of articles being published by members of the service give evidence of the freedom of thought the freedom of speech and the general democratic attitude throughout the service at the present time. Hardly a professional journal can be picked up today which does not have an article published by some member of the Army Medical Service. These articles range from subjects relative to atomic research to articles published in the field of research in personnel matters. Papers are being read by members of the Army Medical Service at many professional association meetings and conferences which is evidence of the proficiency of our Corps.

On all sides the general public is learning that the Army Medical Service is not made up of hard-boiled rigid dictators but that it is comprised of those with free endeavor and free thought. This attitude is the result of well-planned and well-executed policies throughout the Office of The Surgeon General and the members of the Corps. In an article published in the Bulletin of the U S Army Medical Department June 1949 the following observation was made. We are proceeding slowly but satisfactorily with our long range regular officer procurement for the Medical Department. This statement is as true today as it was 2 years ago.

Many Reserve officers who will be on duty during the next few years will find that they have real interest in a career with the Army Medical Service. After all there are not too many vacancies but commissions in the Regular service will remain open so long as vacancies do exist. Those who are interested must be encouraged to investigate further an Army career. Correspondence with this office should always be encouraged if the answers are not available at the station. After commissioning in the Regular service officers are eligible for competitive appointments in residency programs and in many other training programs in a wide field of endeavor in the Medical Service.

Our goal is to make appointments to fill the vacancies in the various Corps of the Army Medical Service from applicants who have sincere interest and who have qualities of judgment leadership and ability which are necessary to maintain the traditions of the service but at the same time lead it to greater and progressive accomplishments.

# A Proposed New Feature

## Listing of Articles Published in Other Journals by Personnel of the Medical Services of the Armed Forces

If a sufficient number of personnel of the Medical Services of the Army, Navy, and Air Force show an interest in furnishing information concerning articles which they have published in other journals, this section will be made permanent feature of the *Armed Forces Medical Journal*. Please give (1) the title of the article, (2) the names and ranks or rates of the authors, and (3) the name, volume and page numbers, and date of the issue of the journal in which the article was published.

—The Editors

## BOOKS RECEIVED

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- Medical Psychology** A Basis for Psychiatry and Clinical Psychology by *G. K. Yacovynski*, Ph. D. Associate Professor of Nervous and Mental Diseases Northwestern University Medical School. 535 pages illustrated. The Ronald Press Co. New York publishers 1951 Price \$6.
- Recovery from Aphasia**, by *Joseph M. Wepman*, Ph. D. Clinical Instructor in Otolaryngology (Speech Pathology) and Lecturer in Psychology The University of Chicago with a foreward by *Wendell Johnson*, Director of the Speech Clinic, State University of Iowa. 276 pages illustrated. The Ronald Press Co. New York, publishers 1951 Price \$4.50
- Bases of Human Behavior** A Biologic Approach to Psychiatry by *Leon J. Saul*, M. D. Professor of Clinical Psychiatry University of Pennsylvania School of Medicine Psychiatric Consultant, Swarthmore College Lecturer Bryn Mawr College 150 pages illustrated. J. B. Lippincott Co. Philadelphia Pa. publishers 1951 Price \$4
- Know Your Teeth**, A General Review of Everyday Questions (with Answers) asked Daily by Dental Patients by *Walter Neal Gallagher* D. D. S. Graduate of the School of Dentistry of Temple University Phila., Pa. Class of 1935 Intern at Forsyth Dental Infirmary for Children, Boston, Mass. Intern at the Temple University Hospital, Phila. Pa.; Extern at Habernang Hospital Phila. Pa.; Practiced General Dentistry Hazleton, Pa. 1936-1942 Member of the United States Naval Dental Corps Member of the American Dental Association Author of *Complete Dental Review* 81 pages illustrated Exposition Press New York, publishers 1950 Price \$2
- Camell Conferences on Therapy** Volume IV edited by *Harry Gold*, M. D., Managing Editor *David P. Barr*, M. D. *McKeen Cattell*, M. D. *Frank Glenn*, M. D. *Walter Modell*, M. D. and *George Reader*, M. D. 342 pages. The Macmillan Co., New York publishers 1951 Price \$3.50
- Recent Advances in Chemotherapy** Volume II by *G. H. Findlay* C. B. E. Sc. D. M. D. F. R. C. P. Editor Abstracts of World Medicine and Abstract of World Surgery Gynecology and Obstetrics British Medical Association, London. 3d edition. 597 pages illustrated. The Blakiston Co. Philadelphia Pa. publishers 1951 Price \$7.50
- Handbook of Antibiotics** by *A. L. Baron*. 303 pages Relabold Publishing Corp. New York N. Y. publishers 1950 Price \$6.50
- Hemodynamics in Failure of the Circulation**, by *W. B. Youmans* M. D. Ph. D. Professor of Physiology Department of Physiology University of Oregon Medical School Portland, Oreg., and *A. R. Huckins* M. S. M. D. Research Assistant, Department of Physiology University of Oregon Medical School Portland, Oreg 71 pages illustrated. Publication Number 88 America Lecture Series Charles C. Thomas, Publisher Springfield, Ill., 1951 Price \$2.75

**Orthopaedic Nursing**, by *Frederick J. Krocke*, M. D., Adjunct Orthopaedist, Lenox Hill Hospital; Attending Orthopaedic Surgeon, Institute for the Crippled and Disabled; Instructor in Orthopaedic Surgery, Columbia University, New York; Diplomate American Board of Orthopaedic Surgery; and *Luz H. S. Krocke*, R. N., B. S., Formerly Head Nurse, Women's Surgical Ward, Lenox Hill Hospital; Clinical Instructor in Orthopaedic Nursing, Hospital for Special Surgery; Instructor (part time) in Nursing Education, Teachers College, Columbia University, New York. 682 pages, 312 illustrations. F. A. Davis Co., Philadelphia, Pa., publishers, 1951. Price \$5.

**Hospital Staff and Office Manual**, by *T. M. Larkowski*, M. D., F. A. C. S., Professor of Clinical Surgery, Stritch School of Medicine, Loyola University, Chicago, Ill., and *A. R. Rasmussen*, R. Ph., M. D., Clinical Instructor, University of Illinois Medical School, Chicago, Ill. 428 pages, illustrated. Rosaline Pierson Publishers, Inc., Great Neck, N. Y., publishers, 1951. Price \$5.

**Dimensional Analysis for Students of Medicine**, by *Harold A. Abramson*, M. D., Assistant Clinical Professor of Physiology, Columbia University; Associate Physician and Chief Allergy Clinic, The Mount Sinai Hospital, New York City; Consultant (Psychology) Department of the Army. 41 pages. The Jewish Macy Jr. Foundation, New York, N. Y., publishers, 1950. Price \$1.

**Hypnotherapy of War Neuroses, A Clinical Psychologist's Casebook**, by *John G. Watkins*, Ph. D., Associate Professor of Psychology, State College of Washington, formerly Chief Clinical Psychologist, Welch Convalescent Hospital, Daytona Beach, Fla. 384 pages, illustrated. The Ronald Press Co., New York, N. Y., publishers, 1949. Price \$5.

**Physical Examination in Health and Disease**, by *Rudolph H. Kampmeier*, A. B., M. D., Associate Professor of Medicine, Vanderbilt University School of Medicine; Visiting Physician to Vanderbilt University Hospital; Chief of the Medical Outpatient Service, Vanderbilt University Hospital, Nashville, Tenn. 821 pages, with 550 illustrations, 1 in color. F. A. Davis Company, Philadelphia, Pa., publishers, 1950. Price \$8.

**A Handbook of Space Flight**, by *Wayne Proell*, Editor, *Journal of Space Flight*, and *Norman J. Bowman*, Ph. D., Editor, *Rocket Abstracts*. 185 pages. Perastation Press, Chicago, Ill., publishers, 1950. Price \$3.50.

**Handbook of Diagnosis and Treatment of Venereal Diseases**, by *A. E. W. McLachlan*, M. B., Ch. B. (Edin.), D. P. H., F. R. S. (Edin.), Consultant in Venereal Diseases, Bristol Clinical Area; Lecturer in Venereal Diseases, University of Bristol; Honorary Consultant in Venereal Diseases, Bristol General Hospital; formerly Clinical Medical Officer, Joint Committee Clinic, Newcastle General Hospital, Newcastle upon Tyne; Lecturer in Venereal Diseases, King College University of Durham; Assistant Medical Officer, Venereal Diseases Department, West London Hospital; Clinical Tutor in Venereal Diseases, University of Edinburgh, etc. 4th edition. 368 pages, with 160 illustrations, 20 in color. The Williams and Wilkins Co., Baltimore, Md., publishers, 1952. Price \$4.50.

**Somatic and Psychiatric Treatment of Asthma**, edited by *Harold A. Abramson*, M. D., Associate Physician and Chief, Allergy Clinic, The Mount Sinai Hospital, New York; Assistant Professor of Physiology, The College of Physicians and Surgeons, Columbia University. 751 pages, illustrated. The Williams and Wilkins Co., Baltimore, Md., publishers, 1951. Price \$11.

- The Doctor, His Career His Business His Human Relations** by *Stanley R. Trauman*, M. D. 151 pages The Williams & Wilkins Co. Baltimore Md. publishers 1951 Price \$3
- Psychological Factors of Peace and War** edited by *T. H. Pear* Contributions by *G. W. Allport, J. Cohen, H. V. Dicks, H. J. Eysenck, J. C. Flugel, Hilde Himmelweit, Madeline Kerr, T. H. Pear, L. F. Richardson*. 262 pages The Philosophical Library Inc., New York N. Y., publishers 1950 Price \$4.75
- The 1950 Year Book of Orthopedics and Traumatic Surgery** (November 1949–November 1950) edited by *Edward L. Compere*, M. D. F. A. C. S., Associate Professor of Bone and Joint Surgery Northwestern University Medical School, Chairman, Departments of Orthopedic Surgery Wesley Memorial and Children's Memorial Hospitals, Consultant Orthopedic Surgeon, Chicago Memorial Hospital, Consultant in Orthopedic U. S. Naval Hospital Great Lake Ill. 388 pages Illustrated. The Year Book Publishers Inc. Chicago Ill., publishers 1950 Price \$5
- Cancer as I See It**, by *Henry W. Abelmann*, M. D. 100 pages Philosophical Library Inc. New York N. Y. publishers 1951 Price \$2.75
- Homicide Investigation Practical Information for Coroners Police Officers and Other Investigators** by *LeMoyne Snyder* Medicolegal Consultant, Lansing, Mich. Member of the American Medical Association, Member of the American Bar Association with chapters by *Harold Mulber* Captain Michigan State Police, Chief Police Administrator Public Safety Division General Headquarters Supreme Commander Allied Powers Tokyo Japan, *Charles M. Wilson*, Superintendent, Wisconsin State Crime Laboratory, *C. W. Musilberger* Director Michigan Crime Detection Laboratory. 359 pages Illustrated. Charles C. Thomas Publisher Springfield, Ill. 1950 Price \$7.50
- College Health Knowledge Test, Personal Health-Form A** by *Terry H. Dearborn* Ed. D. University of California Santa Barbara College Santa Barbara Calif. 11 pages. Stanford University Press Calif. publishers 1950 Price 25 copies \$2.
- Psychiatric Aspects of Juvenile Delinquency A Study prepared on behalf of the World Health Organization as a contribution to the United Nations programme for the prevention of crime and treatment of offenders** by *Lucien Beyer*, M. D. Consultant in Mental Health, World Health Organization, Médecin-chef de l'Office Médico-pédagogique rattaché au Département de Justice et Police de l'Etat de Vaud, Lausanne Switzerland. 90 pages Published by World Health Organization, Palais De Nations Geneva, 1951 Price \$1
- The Education of Nursing Technicians**, by *Mildred L. Montag* Ed. D. R. N., Assistant Professor of Nursing Education, Teachers College Columbia University formerly Director School of Nursing Adelphi College Foreword by *R. Louise McManus* Ph. D., R. N. Professor of Nursing Education and Director Division of Nursing Education Teachers College Columbia University 146 pages. G. P. Putnam's Sons New York publishers 1951 Price \$2.50
- A Synopsis of Surgical Anatomy** by *Alexander Lee McGregor* M. Ch. (Edin.) F. R. C. S. (Eng.) Senior Surgeon Johannesburg General Hospital, Lecturer in Surgery University of the Witwatersrand, with a foreword by *Sir Harold J. Stille* K. B. E. F. R. C. S. (Edin.). 7th edition. 778 pages with 746 illustrations by Dr. E. A. Thomas. The Williams and Wilkins Co. Baltimore Md. publishers 1950 Price \$6.50



*The 1950 Year Book of Neurology, Psychiatry and Neurosurgery* (November 1949–October 1950) Neurology edited by Roland P. Mahey M. D., Professor of Neurology University of Illinois Attending Neuropsychiatrist St. Luk Hospital Chicago; Psychiatry edited by Nelson D. C. Lewis M. D. Director New York State Psychiatric Institute and Hospital; Professor of Psychiatry Columbia University; Neurosurgery edited by Percival Bailey M. D. Distinguished Professor of Neurology and Neurological Surgery University of Illinois 627 pages illustrated. The Year Book Publishers Inc. Chicago Ill. publishers 1951 Price \$5

*Virus and Rickettsial Diseases*, by J. P. Hadson, M. D. F. R. C. P., F. R. S., Professor of Bacteriology London Hospital; A. W. Downie D. Sc. M. D. Professor of Bacteriology University of Liverpool F. O. MacCallum, B. Sc. M. D. Director Virus Laboratory Central Public Health Laboratory; C. H. Stuart-Harris M. D. F. R. C. P. Professor of Medicine University of Sheffield. 382 pages; illustrated. The Williams & Wilkins Co. Baltimore Md. publisher 1950 Price \$4.50

## BOOK REVIEWS

*Woman's Surgeon The Life Story of J. Marion Sims by Seale Harris M. D.* with the collaboration of Frances Williams B. Owsin. 432 pages; illustrated. The Macmillan Co. New York N. Y. publishers, 1950. Price \$5.

In this biography of Dr. J. Marion Sims, founder of the Woman's Hospital in New York and pioneer gynecologist, whose brilliant achievements carried the fame of American surgery throughout the world, the author has made a thorough search of authentic material and covers Sim's life from his childhood to his death. The book is interesting, well written, and includes a bibliography. —*Commander M. A. Godimer MC U. S. N.*

*The Pharmacopeia of the United States of America (The United States Pharmacopeia), Fourteenth Revision (U. S. P. XIV) and The First U. S. P. XIV Supplement.* By authority of the United States Pharmacopoeial Convention, Inc. meeting at Washington, D. C. May 14 and 15, 1940. Prepared by the Committee of Revision and Published by the Board of Trustees. Official from November 1, 1950. 1,066 pages. Mack Publishing Company, Easton, Pa., publishers, 1950. Price \$9.

The new revision of the Pharmacopeia of the United States includes an unprecedented total of 204 items not found in previous revisions. Although not all of these are new drugs, most have been developed in recent years and their inclusion reflects the rapid progress being made in the development of therapeutic agents. Some of the new antibiotics included are aureomycin hydrochloride, chloramphenicol, dihydrostreptomycin, streptomycin, and tyrothricin. Two antihistaminic drugs, diphenhydramin hydrochloride (benadryl) and tripropylamin hydrochloride (pyribenzamine), have been listed. Other new additions are amphetamine sulfate (benzedrine sulfate), callicerol, chloroguanid hydrochloride, chloroquin phosphate, dimercaptopol (BAL), heparin sodium, meperidine hydrochloride (demerol hydrochloride), a phazoline hydrochloride (peivlas hydrochloride), pentylene tetrazol (metrazol), and vitamin B<sub>12</sub>. On the other hand 119 entries have been dropped from the thirteenth revision. The latest Pharmacopeia serves as did the earlier editions, as a book of standards for drugs. —*Commander W. P. Briggs MSC U. S. N.*

*Significance of the Body Fluids in Clinical Medicine* by L. H. Newburgh M. D. Professor of Clinical Investigation, University of Michigan Medical School, Ann Arbor, Mich. assisted by Alexander Leaf M. D. Instructor in Internal Medicine, University of Michigan Medical School, Ann Arbor, Mich. Publication Number 69, American Lecture Series. 76 pages. Charles C. Thomas, Publisher, Springfield, Ill. 1950. Price \$2.

This small, well-bound volume reviews in condensed form much of our current knowledge of body fluids. The author attempts to increase the understanding of disease by first describing the physiology of the body fluids and then pointing out how this knowledge can assist in the clinical treatment of disease. The information concerning extracellular body fluids, which has been

well studied over a period of several years, as well as the more recent information concerning intracellular fluid, is well summarized. The volume is divided into sections on physiology and on its clinical significance which outline the effect of various types of disease on fluid and electrolyte balance. This section also points out the type of therapy which may be used to correct disorders in these components. Particular emphasis is placed in this section on the great importance of potassium deficiency and excess in certain diseases and the value of correcting these abnormalities. This book would be of value to any physician whose patients require adjustment of their fluid or electrolyte balance.—*Commander J. E. Gorman, MC, U. S. N.*

*Eyes and Industry formerly Industrial Ophthalmology* by *H. Aug. S. Kuhn, M. D., Industrial Ophthalmologist, Hammond, Ind.* 2d edition. 377 pages with 151 text illustrations including 3 color plates. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price \$8.50.

This second edition continues to be an authoritative treatise by one qualified to speak in industrial ophthalmology. The book is well organized and proceeds in an orderly manner from the initial chapter on visual testing in industry to the final chapters on such special problems as the blind in industry and epidemic keratoconjunctivitis. Dr. Kuhn has employed an informal style which makes for facile reading. Statistical analyses and charts have been used sparingly and judiciously. Her approach to the many facets of industrial ophthalmology is eminently practical, scientific, and humane, evidenced by the excellent chapters on eye protection and corrective programs. The section on eye injury by Dr. Albert C. Saeffli is an incisive essay along general lines of value chiefly to the ophthalmologist who is experienced in handling industrial cases. Details of technique and illustration are omitted from this section. An appendix has been added which includes many useful references, particularly the section on appraisal of the visual efficiency and standing first-aid orders for nurses treating eye injuries. This book has no parallel in ophthalmology. It will greatly further the industrial safety hygiene program by being a valuable reference and inspiration to the profession.

—*Commander G. L. Taylor, J. MC, U. S. N.*

*Evaluation of Industrial Disability* Prepared by the Committee for Standardization of Joint Measurements. Industrial Injury Case of the California Medical Association and Industrial Accident Commission, State of California. 89 pages illustrated. Oxford University Press, New York, N. Y., publishers, 1950. Price \$4.

This book represents the work of a committee authorized by the Council of the California Medical Association to develop standardized methods for evaluating and reporting joint motion restrictions resulting from industrial injury. Except for brief general instructions, the book is entirely devoted to the methods of measuring and reporting individual joint motions. The material is so arranged that the text page faces the page with the illustrating photodiagram. The range of an individual joint motion is recorded. Division of the motion present in the corresponding joint on the opposite side. For example if the range of abduction of the uninjured shoulder is 175° and the range of the injured side is 130° the shoulder abduction is reported as Shoulder abduction 130/175. Proper use of this book should simplify disability evaluation so that special training is not required to make satisfactory reports. The book is a workshop or laboratory manual with concise, clear-cut instructions. It will be an excellent adjunct to the library of anyone concerned with making physical disability evaluation of joint motion restriction resulting from injury and will be of great aid in assisting the industrial surgeon in applying the principle of selective placement of the disabled worker.

—*Col. P. A. Kenney, MC, U. S. A.*

**The Person as a Nurse (Professional Adjustments)** by *Florence C. Kemp*  
 R. N., A. M. Assistant Director of Nursing Service University Hospitals of Cleveland Ohio formerly Associate Director Hartford Hospital School of Nursing Assistant Director, Massachusetts General Hospital School of Nursing 236 pages. The Macmillan Co., New York N Y publishers 1950 Price \$3.25

This book will enable the student nurse and the pre-nursing student to learn the requirements and the qualities necessary to one desirous of entering the nursing profession. The first two chapters are particularly good the first gives the reader an excellent example of by whom and how students are selected for the school and the second describes the initial adjustments of the same students discussed in chapter one to the school. The point is made that in addition to good grades in nursing theory an adequate personality is necessary in order to live and work with many people in this profession. The text should also be of value to those interested in personnel work as it brings out some of the problems encountered in integrating varied personalities into a career that demands much self-adjustment to produce the best results. Miss Kemp has presented the material in a most interesting manner, which makes for enjoyable reading.—*Lt. Comdr M. Terrill, NC, U S N*

**Modern Trends in Obstetrics and Gynaecology** edited by *Kenneth Brues*  
 M D M S. (Lond.), M B., Ch. B (Liverpool), F R. C. S., Obstetric Physician, St. Thomas's Hospital Surgeon, Grosvenor Hospital for Women, London, Consultant Gynaecologist, S. W. London Regional Metropolitan Board Examiner to the Examining Board in England Sometime Examiner, University of London 778 pages illustrated. Paul B Hoeber, Inc. New York, N Y., publishers 1950. Price \$12.

This book is a collection of monographs written by men who are considered authorities in their fields. The introduction outlines the purpose of the book by stating, "The wealth of anatomical, physiological, and other researches on fundamental problems of gynecology and obstetrics which has appeared during the last fifteen years makes it necessary for a book on line of progress in these subjects to include chapters from contributors who are not engaged in clinical work in them, and an attempt has been made to bring together material from various fields to indicate some subject of immediate interest, and to mention the main trends in clinical obstetrics and gynecology."

Of the book's 34 chapters some are exceptionally well written and some are average but none are poor. Some merit special comment. The first on the anatomy of the bony pelvis and pelvic floor is clearly written and well illustrated. This is followed by one on the vascular anatomy of the adult human uterus dealing with dynamic rather than static angiology. The latter is in a relatively new field. It is specially well written and should be read by all those who are interested in the physiology of the endometrium. The chapter on psychologic factors is brief but many and most readers will agree with its fundamental assertion. A very important and usually neglected subject is well handled in the chapter on the physiology of the placenta. The various phases of this physiology such as placental development, hemodynamics, the mechanism and dynamics of placental transfer or passage of crystalloids, colloids, immune proteins, organisms, water and so on are presented in clear concise language. This chapter includes a resume of the concept of the control of maternal metabolism by the placenta through its hormone elaboration.

**Aspects of Foetal Physiology** by *Windle* is a reprinting of his monograph *Asphyxia Neonatorum* (Charles C Thomas Publisher Springfield, Ill.). It is outstanding and should be studied in either book by all who treat the newborn. The chapter on the Rh factor in pregnancy by *Mollison* is the best article I have read on this complex and controversial subject. *MacLennan's* chapter on

hemorrhage associated with pregnancy and childbirth is exceptionally good. H and Johnson are the leader in the fight for the conservative management of ante-partum hemorrhage, especially in placenta praevia. I believe theirs is the only acceptable management of this frightening complication. Such management has been shown to reduce maternal and infant mortality as well as the incidence of caesarean section.

In chapter on heart disease and pregnancy termination of pregnancy up to the sixteenth week in New York Academy Grade II b or III heart disease is advocated but for this period interruption involves too great a risk. I believe most American clinics would agree but would not usually interrupt pregnancy in Grade II b patients. Early interruption of pregnancy is also recommended in patients classified Grade III in previous pregnancy. I believe that patients in Grade III should be sterilized before they again become pregnant. I give that caesarean section in late pregnancy in arduous patients is undesirable. The chapter on tuberculosis and pregnancy states that therapeutic abortion is rarely either necessary or beneficial to patients with this disease. That on the operative treatment of genital prolapse by Shaw is masterfully written but unfortunately biased and effusive operation for prolapse of the vaginal vault after hysterectomy is not described.

The bibliographies, at the end of each chapter, are complete in that most if not all important references are listed.

This book is well arranged, printed clearly on good paper has good but too few illustrations and is excellently written.

—C L J W Simpson, MC, U S A

*Comparative Animal Physiology* by David W Bishop Professor of Physiology University of Massachusetts Frank A. Brown, J Professor of Biology Northwestern University Theodore L. Jahn, Professor of Zoology University of California Los Angeles; C. Ladd Prosser Professor of Physiology University of Illinois; and Vernon J. Waloff Assistant Professor of Physiology University of Illinois edited by C. Ladd Prosser 858 pages Illustrated. W B Saunders Co., Philadelphia Pa., publisher, 1950. Price \$12.50.

This book is further documentation of the zoologic maxim that ontogeny repeats phylogeny. The authors carry this thesis from consideration of water utilization by protozoa to water balance among higher vertebrates, through the chief divisions of animal function to and including consideration of primitive conduction of waves of excitation up to the most complex conditioning and learning among the higher animals. The work is thoroughly scholarly. Each chapter has an extensive but selective bibliography and helpful conclusion or summary is found at least once in each chapter. The book is complete and well prepared. Those whose attention has been concentrated on mammalian physiology will be surprised to find this book comparative in its wider sense. A much or more attention is given to lower phyla as to the Class Mammalia. *Phylum vertebrata*. Examples are cited frequently by scientific name, e.g., *Oncomeryx*, *Dytiscus*, *Raja*, et cetera, which are not found in medical dictionaries or standard English dictionaries. This makes comprehension more difficult for persons without recent experience in zoologic nomenclature. Although this volume will not be of immediate value to the clinicians, it points out generalizations of value to persons engaged in experimental medicine.—Max R. O. Anderson VC U S A.

*Child Psychiatry in the Community* Primer for Teachers, Nurses and Others Who Care for Children, by Harold A. Greenberg M D Senior Staff Psychiatrist, Institute for Juvenile Research, Chicago Assistant Professor of Childmology College of Medicine University of Illinois Chicago is

collaboration with *Julian H. Pathman*, Ph. D. Chief Psychologist, Downey Veterans Administration Hospital, Downey Ill. formerly Assistant Professor of Psychiatry and Psychologist, Illinois Neuropsychiatric Institute College of Medicine University of Illinois Chicago formerly Senior Staff Psychologist, Institute for Juvenile Research, Chicago *Helen A. Sutton*, R. N. B. A., B. S. formerly Psychiatric Nursing Instructor Illinois Neuropsychiatric Institute College of Medicine University of Illinois Chicago and *Marjorie M. Browne* B. A., M. A. Instructor School of Social Service Administration, University of Chicago 796 pages, illustrated C. P. Putnam & Sons New York N. Y. publisher 1950 Price \$3.50

The function and purpose of this volume is best described by the subtitle. The book has the limited, but valuable objective of explaining operation of a child guidance clinic in all its component parts to those in any community who are interested in child welfare and who are in a position to refer patients in need of therapy. A short introductory section describes the psychogenesis of behavior disorders. The style is clear and the terminology is precise. No effort is made to teach therapy but a step by step description of the operation of a clinic is given. There are chapters by a clinical psychologist, psychiatrist, nurse, and psychiatric social worker respectively detailing their functions. The relationship of the entire team to the community is discussed in detail. Most of the material was collected at the famed Institute for Juvenile Research in Chicago with some comparisons with other child guidance organizations. The appendix includes a short glossary and bibliography that should be helpful to the reader for whom the book is designed. It well fulfills its intended function.—*Commander F. H. Ocho, MC, U. S. N.*

*Introduction to the Regulation of Blood Pressure and Heart Rate*, by *Cornelius Heymans* M. D. Professor of Pharmacology University of Ghent (Belgium). Publication Number 43 American Lecture Series. 60 pages illustrated. Charles C. Thomas, Springfield Ill. publisher 1950. Price \$2

This brief introduction to the subjects presented touches on the many factors involved in the physiologic process concerned. A medical student might feel rewarded after glancing through this presentation prior to a final examination in physiology as such a review might recall details of the more elaborate concept of such physiologic processes. A practitioner out of contact with scientific thought might be able to refresh dormant recollections of physiologic principles by such reading. Most of the bibliographic references are not in English and less than one-third cite American literature. As an example it may be noted that, although his name is mentioned once in the text, no bibliographic reference is made to the many contributions in the past 40 years of Carl J. Wiggers to the understanding of the physiology of the circulatory system.

—*Col. R. L. Cox MC U. S. A.*

*Problems in Cerebellar Physiology* by *G. Moruzzi* M. D., Professor and Head of the Department of Physiology University of Pisa, Pisa, Italy. Annual Research Professor of Neurology Northwestern University Medical School, Chicago Ill. 116 pages, illustrated. Charles C. Thomas, Publisher Springfield Ill. 1950 Price \$3.25.

This small monograph by an authority on neurophysiology presents a critical and lucid review of recent advances made in physiologic studies of the cerebellum and it gives one a clear concept of the critical approach which is so necessary in analyzing the experimental facts available and in forming the hypotheses for future research. It outlines the recently acquired knowledge of the physiology of the anterior lobe of the cerebellum. The author discusses the cerebellar inhibition and facilitation of postural tone, the functional interrelations between the cerebellum and the cerebral motor cortex, and the

influence of the cerebellum on certain autonomic functions. The title is well chosen—the newer electrophysiological methods have accentuated some of the older problems they solved others and they have also uncovered new and broader problems. There is a short but adequate index and bibliography of 85 references.—Lt. Comdr R. G. Berry MC, U S N

**Visual Anatomy: Head and Neck**, by Sydney M. Friedman, M. D., Ph. D., Professor of Anatomy University of British Columbia Vancouver, Canada; Formerly Associate Professor of Anatomy McGill University Montreal, Canada. 217 pages; illustrated. Charles C Thomas, Publisher Springfield, Ill. 1950. Price \$6.50.

Any attempt to facilitate the learning of anatomy or to prolong its retention after learning has always been welcome. For that reason this book should have particular appeal to a large group of medical practitioners and students. The author presents the anatomy of the head and neck in such a way that it can easily be remembered, reconstructing it from within outward, much in the same manner a sculptor or medical illustrator might. This book was not meant to supplant standard anatomy texts, but rather to supplement them. The fact that each diagram is supplied with facing page of text decreases the amount of page turning, and makes the study of the diagram easy and pleasant. The manner in which the various planes and muscle layers of the submandibular region are presented doubtless clarify the relationship of structures in that area. The author has interspersed this text abundantly with clinical applications of the anatomy in the area under discussion. There is but one criticism to be made of this excellent volume. The author could be enhanced the ease of recognition and the permanence of retention of many of his illustrations if he had extended his practice, applied in a few figures, of using red and blue to indicate arteries and veins.—Lt. Comdr M. Schiff MC U S N

**Methods in Medicine, The Manual of the Medical Service** of Georg Dock, M. D., Sc. D., Formerly Professor of Medicine Washington University School of Medicine; Formerly Physician-in-Chief Robert A. Barnes Hospital, St. Louis. A Comprehensive Outline for Clinical Investigation, Management, and Treatment of Patients with Various Medical Disorders by Georg R. Herrmann, M. D., Ph. D., Professor of Medicine, University of Texas Medical Branch at Galveston, Director of the Cardiovascular Service and Heart Station, University of Texas Hospitals; Consultant in Medicine to the Surgeon General, U S Army; Consultant in Vascular Diseases to the Marine Hospital, U. S. P. H. S. 2d edition, completely revised. 488 pages. The C. V. Mosby Co. St. Louis Mo., publisher, 1950. Pp. \$7.50.

This book discusses briefly the material that should be included in medical history and physical examination. There are clear and concise instructions for performing most of the common laboratory tests. Simple procedures such as the red blood cell count, routine urinalysis, measurement of vital capacity and determination of creatinine clearance are included as well as a method for the determination of serum potassium. The fact that there are no illustrations in the book reduces its cost but makes it of less value. The book would be useful to the student during his clinical clerkship and to the intern who may have performed many of the tests. Any of the standard texts on laboratory methods would serve equally well. The chapter on dietary methods is excellent. Peptic ulcer, low sodium, low cholesterol, and diabetic diets are discussed in sufficient detail for the average internist. The book would not be of much value to the experienced internist.—Col. M. C. Davidson, MC, U S A.

**Encyclopedia of the Eye, Diagnosis and Treatment**, by *Conrad Barrens M. D.*, F. A. C. S., Executive Eye Surgeon, New York Eye and Ear Infirmary, Professor of Clinical Ophthalmology Post-Graduate Medical School, New York University President, Pan-American Association of Ophthalmology Managing Director of the Ophthalmological Foundation, Inc. President, Snyder Ophthalmic Foundation, and *Edward Siegel, M. A., M. D.*, Attending Ophthalmologist, Champlain Valley Hospital Plattsburg, N. Y. Associate Attending Ophthalmologist, Physicians Hospital, Plattsburg. 272 pages 76 illustrations including 42 subjects in color. J. B. Lippincott Co., Philadelphia Pa. publisher 1950 Price \$5

This text, using the encyclopedic form provides a quick reference for the diagnosis and treatment of the more common ophthalmologic conditions. For this reason its greatest value will be to the busy general practitioners, pediatricians, and medical students. Ophthalmologists and others may also benefit from it. The title refers more to the form than to the comprehensiveness of its contents. The authors note this in the preface and state that the term encyclopedia is used with 'apology for many terms and much of the detail that ordinarily would be used in such a volume has been omitted. The common problems that the physician encounters are stressed. The sections on pediatric ophthalmology and therapeutics are particularly praiseworthy. Where surgery is indicated the name of the operation is mentioned, but details are lacking as beyond the scope of the text. The illustrations are good but are grouped together in about the center of the book rather than adjacent to the context. The information in this book is condensed, readable and practical. It is well indexed.—*Col. A. A. Albright MC, U S A.*

**The 1950 Year Book of General Surgery** (July 1949–June 1950) edited by *Ernest A. Graham, A. B. M. D.*, Professor of Surgery Washington University School of Medicine Surgeon-in-Chief of the Barnes Hospital and of the Children's Hospital, St. Louis with a section on Anesthesia edited by *Stuart C. Call, M. D.* Professor of Surgery and Chairman of Division of Anesthesiology State University of Iowa College of Medicine and Hospitals. 670 pages illustrated. The Year Book Publishers Inc., Chicago Ill. publishers 1950. Price \$5

This volume has extracted much that is good from the surgical literature of the period covered. The abstracts contain the gist of the article abstracted but necessarily lose much of interest in the process of condensation. A highly concentrated summary of many subjects presents the reader with too much in too short a space to allow proper absorption and digestion. By the use of the Year Book, however, one may call subjects of particular interest from which complete reference may later be obtained. The introduction prepared by Dr. Graham for this volume highlights the surgical advances of the past decade. Progress in anesthesia and thoracic surgery during this period is indeed impressive. Review of the essays presented in the volume reveals much collation of statistics and development in technique but little advance in the fundamentals of surgery seems to have been accomplished in 1950.

—*Lt. Col. F. D. Threadgill, MC U S A*

**Neurology and Psychiatry in General Practice** edited by *Henry R. Viets M. D.* in collaboration with *C. Charles Burlingame M. D.* *Clarence B. Farrar M. D.* and *Z. M. Lebensohn, M. D.* 150 pages. Grune & Stratton, Inc. New York N. Y., publisher 1950 Price \$3.50.

For practitioners who have little free time to follow advances in neurology and psychiatry this book offers a "simplified, frank, and eclectic" sampling of outstanding problems which may be encountered in daily practice. Sufficient information is presented usually in a clear and concise manner to orient the



physician toward the proper understanding and generally accepted treatment of the physical and emotional illnesses discussed. Because it is not intended to be a textbook, neither suitable bibliography nor references have been made available. This is regrettable for it does not allow the physician to amplify his knowledge if he so desires.

The neurological section is better written than the psychiatric section. The importance of recognizing the effect of emotional factors in all the discussion of organic neurologic diseases is emphasized. Epilepsy, Parkinsonism, and neurosyphilis are skillfully discussed. The discussion of migraines and other headaches, with their multiple psychologic and organal ramifications is so condensed that prior to using each therapeutic procedure outlined, the physician should be well aware of the total personality make-up and emotional factors that may also influence the patient's response to therapy.

In the psychiatric section, much valuable information and many useful principles are offered. The discussions of the alcoholic patient, the management of anxiety, and electro-convulsive therapy are excellent. Psycho-somatic medicine and psychotherapy are superficially described. In some instances, statements are made which appear to misrepresent the facts. For example, in the discussion "Referring the Patient," the "pure" psychoanalyst is compared to the psychiatrist, though the psychoanalyst often disregards many psychiatric procedures of well-established value. A competent, well-trained medical psychoanalyst is primarily a well-trained psychiatrist who would actually consider all factors involved in the proper treatment of patients and one who used full-scale psychoanalysis only in those cases which meet certain basic requirements for such therapy. The medical psychoanalyst constantly makes use of dynamic psychology and analytical understanding in his approach to all patients.

Knight (1) has aptly observed. In principle, a competent therapist will evaluate the patient and select from available psychotherapeutic approaches and techniques, those which, in his best clinical judgment, are most appropriate. Any given case he will either use them if they are part of his armamentarium or refer the patient to the proper therapist whether it be for full-scale analysis or for electroshock therapy or other special therapies.

This publication will serve its purpose well in making neurologic and psychiatric subjects simple and interesting to general practitioners and should stimulate them to increased activity in these fields.

—Lt. Col. L. E. Gatto, U. S. A. F. (MC)

*The Dispensatory of the United States of America*, by Arthur Osol, Ph. G., M. S., Ph. D., Professor of Chemistry and Director of the Department of Chemistry, Philadelphia College of Pharmacy and Science; Member of the Committee of Revision of the United States Pharmacopoeia, and George E. Farrer, J. M. D., F. A. C. P., Associate Professor of Medicine, School of Medicine, Temple University; Member of the Committee of Revision of the United States Pharmacopoeia; With E. Emerson Lemmon, M. Sc., D. Sc., Professor of Pharmacy and Chairman of the Department of Pharmacy, Columbia University College of Pharmacy; Pharmacy Editor, *American Druggist*; Heber W. Youngren, Ph. M., Ph. D., Sc. D., Professor of Pharmacognosy and Biology, Massachusetts College of Pharmacy; Member of the Committee of Revision of the United States Pharmacopoeia; Willard F. Verway, Sc. D., Director of Bacteriological Research, Medical Research Division, Sharp and Dohme, Inc., and David K. Detweiler, V. M. D., M. S., Assistant Professor of Pharmacology, School of Veterinary Medicine, University of Pennsylvania; Advisory Editor, Horatio C. Wood, J. M. D., Ph. M.,

(1) A Critique of the Present State of the Psychotherapies, by Robert P. Knight, M. D., published in the Bulletin of the New York Academy of Medicine, February 1949.

Professor of Pharmacology Philadelphia College of Pharmacy and Science Complete in two volumes Volume 1 Based on the Thirteenth Revision of The United States Pharmacopoeia, The National Formulary Eighth Edition, and The British Pharmacopoeia 1932 and its Addenda. Volume 2 (bound with Volume 1): Being a commentary on the new drugs introduced in the Fourteenth Revision of The United States Pharmacopoeia, The National Formulary Ninth Edition, The British Pharmacopoeia 1948, as well as the new drugs not officially recognized. 24th edition. 2,057 pages. J B Lippincott Co., Philadelphia P publisher 1950. Price \$25

The United States Dispensatory Volume I 24th Edition published in 1947 is based on the Thirteenth Revision of the United States Pharmacopoeia the National Formulary Eighth Edition, and the British Pharmacopoeia, 1932 and its seven addenda. Every drug and preparation of the legal standards including all of the new antibiotics hormones, antihistaminics, et cetera is covered in detail Descriptive articles on practically all substances important to the professions of pharmacy and medicine but not included in the three legal standards are also presented the substances recognized in New and Non-official Remedies are especially designated.

Volume II of the 24th Edition, published in 1950 and bound with Volume I includes the new drug of the Fourteenth Revision of the United States Pharmacopoeia the National Formulary Ninth Edition, the British Pharmacopoeia 1948 and 88 new drugs not officially recognized Cortisone ACTH folic acid antagonists tetracyclin mephensin benzachlorophene and other new items only recently reported in the current literature are described. The primary purpose of each edition of the Dispensatory is to provide information about new drugs and current information about drugs already in use An entirely new section dealing with the uses and doses of drugs employed in veterinary medicine has been added in the new edition which also includes data on general tests processes reagents and solutions as well as various tables that are not found in the Pharmacopoeia or National Formulary

The first edition of the Dispensatory appeared about 115 years ago. In the past it was probably used more by the pharmacist than the physician but today it contains so much information on both medical and pharmaceutical matters not readily available elsewhere that this reference is of daily value to the pharmacist, physician, laboratory worker and teacher. Complete and authoritative individual monographs are arranged alphabetically according to the English title Each provides full coverage of the subject, including Latin titles abbreviation official definitions official and unofficial synonyms, and foreign language titles Various trade names and trade-marks with details of the manufacturing process and history are presented. These monographs give official descriptions including tests assay methods constituents and adulterants. A portion of each monograph is devoted to a discussion of therapeutic uses and dosage Many significant details of usage are included and special emphasis is placed on the toxicology of the drug and precautions to be observed during its administration. The format is convenient and agreeable and the book has been carefully indexed.

—Commander W P Briggs MSC U S N

The Preparation of Photographic Prints For Medical Publication, by Stanley J McComb F B P A Section on Photography Mayo Clinic Rochester Minn. 65 pages illustrated. Charles C Thomas, Publisher Springfield, Ill., 1950. Price \$2.

The novice or inexperienced photographer will gain from this book an appreciation of the value of good illustrations in the presentation of technical and scientific subject matter for medical publications Some of the frequently en-

concerned problem are described in concise manner and easily accomplished corrective procedures are presented. The author has adhered to standard of "maximal definition and clarity of detail. The information is grouped to include such factors as sharpness of focus, scale-size and position, background, lighting, emphasis (high point of interest), film and filters, printing and print quality technique for improving print quality and trimming and grouping of plates.—E. M. Green, M. D.

**Fainting, Physiological and Psychological Considerations**, by George L. Engel, M. D., Associate Professor of Medicine and Psychiatry The University of Rochester School of Medicine and Dentistry Rochester N. Y. Publication Number 37 American Lecture Series 141 page Charles C. Thomas, Publisher Springfield, Ill. 1950. Price \$2.75

In this monograph, the author attempts to explain the mechanisms and clinical characteristics of the various types of fainting in the light of modern physiology and psychology knowledge. In large part it is a summary and elaboration of original studies and experiments carried out by the author and his coworkers. Syncope as defined here is not limited to the state of unconsciousness but includes such premonitory symptoms as giddiness, faintness and weakness. With this definition in mind, syncope has been grouped into different types according to underlying, common mechanisms. Thus syncope may be caused by (1) fall in arterial blood pressure (2) cardiac standstill, (3) cerebral vascular disorders (4) cerebral metabolic disorders, (5) hysteria, (6) hyperventilation and (7) heart disease.

Succeeding chapters deal with the symptoms, signs, etiologic factors, and treatment in connection with each of these causes. According to the author, vasodepressor syncope is probably the most common form of fainting and represents a reaction which occurs during the experiencing of fear when action is inhibited or impossible. Thus the psychological factor is of major import in the genesis of this particular form of fainting. To a greater or lesser extent psychological influences are concerned in the causation of the other types of syncope. The outstanding attribute of the monograph is the simplicity and clarity of expression and the absence of technical graphs and involved statistical data. Consequently it should be of great practical benefit to the practicing physician as a diagnostic aid. The only criticism that might be offered is that treatment techniques are too briefly described.—Lt. Col. D. S. Evans U. S. A. F. (MC)

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# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
Agency Department of Defense*



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THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY  
THE DIRECTOR OF THE BUREAU OF THE BUDGET OCT 19 1949

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON 1951

For sale by the Superintendent of Documents, U. S. Government Printing Office  
Washington 25 D. C.

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Subscriptions should be sent to the Superintendent of Documents United States Government Printing Office Washington 25, D. C.

Yearly subscription, \$4 foreign subscription, \$5.25

Single number 25 cents.

Exchange of publications will be extended to medical and scientific organizations societies, and journals. Communications on this subject should be addressed to the Editor UNITED STATES ARMY FORCES MEDICAL JOURNAL, Post Office Annex, Department of the Navy Washington 25, D. C.

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Address: U. S. Armed Forces Medical Journal, Bureau of Medicine and Surgery Department of the Navy, Washington 25, D. C.

FREDERIC W. FARRAR, *Editor in Chief*

*Capt., Medical Corps*

*United States Army*

WILLIAM G. HENDRY, *Associate Editor*

*Colonel, Medical Corps*

*United States Army*

ROBERT J. HENFORD, *Associate Editor*

*Colonel, Medical Corps*

*United States Air Force*

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# New Method of Printing the Armed Forces Medical Journal

The offset method of printing has been adopted for the *U S Armed Forces Medical Journal* beginning with this issue. In the offset process a photographic negative is made of the copy in the exact form in which it is finally to appear. The negative is then used in the preparation of a metal plate for the printing stage. Compared with the letter press method, formerly in use the offset process though less perfect in some respects, offers certain worthwhile operational advantages of particular importance are (1) simplicity (which means fewer steps in the checking and editing of proof in preparation of plates for the final printing) and (2) all the operations up to and including the preparation of the finished copy from which the negatives and plates are made by the printer are carried out in the editorial office directly under the supervision of the editorial staff. Use of the offset process permits a greater flexibility in the preparation of material for publication and makes possible the elimination of from four to six weeks in the production schedule for each issue, thus enabling a more effective use of current material.

It is believed that the adoption of the offset process will prove of value in the implementation of a program designed to increase the usefulness of the *U S Armed Forces Medical Journal* to the personnel of the Medical Services of the Armed Forces.

—The Editors



OFFICE OF THE SECRETARY OF DEFENSE  
ARMED FORCE MEDICAL POLICY COUNCIL  
WASHINGTON 25, D. C.

**MEMO- Personnel of the Medical Services of the United States Armed Forces.**

To all of us in the medical services of the Armed Forces who feel deep sense of responsibility to our fellow men and our military comrades and who share with them the rigors, hardships, or disappointments as well as the glories or honors, there comes true understanding of the words shipmate "GI," or "air crew" and with this understanding the prideful right "to belong."

Occasionally the glamour associated with our well publicized units, hospitals, and medical centers, or the appeal of the frontiers of research as yet uncharted in our laboratories cause an unseasoned and usually young officer temporarily to wander from that inviolate obligation and sense of deep responsibility which he assumed when embarking upon his career in his chosen field of the healing arts.

Whether we serve with units in the field, afloat, at advanced air bases, or at large fixed establishments let us not forget our obligations and responsibilities to ourselves and to our fellow men and military comrades to give our all if need be to sound military medical service in full support of our combatant forces.

*Richard L. Melling*  
Richard L. Melling, M.D.  
Chairman

# UNITED STATES ARMED FORCES MEDICAL JOURNAL

Volume II

April 1951

Number 4

## Group Panic and Other Mass Disruptive Reactions

John M. Caldwell *Colonel MC, U S A. (1)*

Stephen W. Ranson, *Lieutenant Colonel, MC, U S A. (1)*

Jerome G. Sacks, *Lieutenant Colonel, GSC, U S A. (2)*

**I**N THE event of an atomic attack or sudden disaster (3) affecting a civil population there may be widespread panic in the affected area unless there is adequate planning and organization designed to prevent and to control panic behavior. It is possible that loss of life may be greater by reason of panic than as a result of the disaster itself.

In the Texas City disaster the explosion of the French ship *S. S. Grandcamp* occurred at 9 10 a. m., 16 April 1947 and 20 minutes later the nearest Army Installation, Fort Crockett near Galveston, was contacted for aid. At the request of the local sheriff's office the Commanding Officer Fort Crockett, suspended normal operations at 0930 and dispatched all available personnel both military and civilian, to Texas City with the primary mission of evacuating injured to Galveston (4). Furthermore "the Army assisted the Red Cross by continuing to rescue, feed, house and administer medical aid to civilians of the stricken area until 22 April. The Army supplied over 200 doctors and nurses, medical supplies for 5 000 victims, operated 2 food kitchens serving 2 000 meals daily plus 2 dock area canteens serving coffee and sandwiches, operated 2 refugee camps with a total of 5,000 person capacity and supplied equipment for all the above plus food for the first 2 days. Engineer, Quartermaster and other supplies including nu-

(1) Psychiatry and Neurology Consultants Division, Office of the Surgeon General, Department of the Army.

(2) Office of Chief of Psychological Warfare, Office of the Chief of Staff, Department of the Army.

(3) A disaster may be defined as a situation, usually catastrophic in nature, in which a number of persons are plunged into helplessness and suffering and, as a result, may be in need of food, clothing, shelter, medical care and other basic necessities of life.

When Disaster Strikes. American National Red Cross, Washington, D. C., 1948. p. 1.

(4) Annex I of Sixth Army Disaster Relief Plan, July 27, 1949.

merous trucks and ambulances were provided and radio communications were forwarded by Fourth Army Signal Section. Army aid was withdrawn gradually as the Red Cross and civilian agencies' needs decreased and Army activities ceased on 26 April 1947. (4)

Less than 12 hours after the beginning of the Detroit "Bloody Week" race riot in 1943 (war year), aid in controlling the riot was sought from the Army. Mayor Jeffries telephoned Governor Harry F. Kelly and asked that Federal troops be summoned. The Governor transmitted this plea by telephone to Sixth Service Command Headquarters. (5)

The point in citing these examples (and numerous others could be mentioned, as well as citing those in which the Navy worked with the Army or those in which the Navy alone played a supportive or predominant role) is to show that the Armed Forces are from time to time called on to render aid to civilian populations which are unprepared to cope with major disasters. Plans for dealing with disasters including the prevention and control of panic should be developed for all civilian communities so that aid from the Armed Forces during disaster will not be required. The facilities of the Armed Forces will not then need to be diverted from other missions in time of war or national danger. "The fear reaction of the uninitiated civilian is ever evident. It is of such magnitude that it could well interfere with an important military mission in time of war." (6)

### CAUSES OF PANIC BEHAVIOR

The word panic has its origin in the fear and fright caused by the legendary god Pan, son of Zeus. Panic is sudden, overpowering and groundless fright terror inspired by trifling cause or a misapprehension of danger especially when accompanied by unreasoning or frantic efforts to secure safety. (7) On the other hand panic may occur in the presence of real or imminent danger. "Panic involves temporary major disorganization of thinking and control of fear Consciousness is usually clouded. The most common expression of true panic on the battlefield is the panic run, in which, usually during shelling the soldier deserts cover and dashes about impulsively, exposing himself to flying shell fragments." (8)

Panic behavior occurs when fear spreads through a crowd and the crowd gets out of hand. Panic behavior is the synthesis to gimental behavior. (9) Panic occurs where some highly cherished

(1) Lee, A. M. and Humphrey M. D. Race Riot. The Dryden Press, New York, N. Y., 1943. p. 50.

(2) Conner, J. P. Psychological Factors in Atomic Warfare. U. S. Armed Forces Special Weapons Project, Radiological Defense. Vol. 3. U. S. Government Printing Office, Washington, D. C., 1950.

(3) Webster's New International Dictionary of the English Language. G. & C. Merriam Co., Springfield, Mass., 1944. p. 1764.

(4) Ransom, E. W. The normal battle reaction: its relation to pathologic battle reaction. Bull. U. S. Army M. Dept. (supp.) pp. 3-11, Nov. 1949.

(5) LaPiere, R. T. Collective Behavior. McGraw-Hill Book Company, New York, N. Y., 1938. p. 457.

rather commonly accepted value is threatened and when no certain elimination of the threat is in sight. The individual feels that he will be ruined physically financially or socially (10) When a large number of persons gathers around a common object of interest or attention a crowd exists. In a crowd there must be a focus or polarization of attention on "something seen heard or sensed together" (11) Like filings around a magnet the crowd is drawn toward one focus of attention and action (11) In another kind of a group a radio audience the attention is also focused on a common subject such as the voice of the speaker orchestra music or a play An example of a major panic which developed among members of a radio audience occurred during the now classic Invasion from Mars broadcast in the fall of 1938 (10)

Panic behavior is the antithesis of crowd behavior. In panic there is a flight from the common point of attention. The crowd is broken up; disorganization occurs because polarization of action and attention disappears and along with it the regimentation which has bound the crowd together into mass action mass attention and mass strength. In group panic action is individual there is uncoordinated interaction with other members of the group and the action by its members is usually irrational and fruitless. The members of the panic group may act together but the action may be illogical irrational and even dangerous to the group members.

*Tension and insecurity* contribute to panic. In group or individual panic the basic emotion is fear. The predominant action is a frantic effort to escape danger real or imagined. Tension accompanied by insecurity increases the degree of panic when the stimuli for panic are introduced into the group. Panic is a maximal fear state which results from prolonged tension and insecurity. \* a careful study and analysis of large case material proves that a great variety of factors and situations may produce a tension in certain constitutional make-ups and that panic is the climax of tension. (12) When the group is tense and insecure and when imagined danger has not been dispelled the stage is set for the introduction of stimuli to produce panic even in a regimented group as in the Army. "In a state of mass insecurity people are susceptible to propaganda because there has been a weakening of the ego. Mass insecurity is pooled uncertainty together with individual inner anxiety. (13) An illustration of an incident of panic behavior among 115 000 soldiers who had built up a high degree of tension and insecurity was cited by Young (14):

(10) Cantril, H., Gaudet, H., and Hertzog, H.: Invasion from Mars. Princeton University Press, Princeton, N. J. 1940. p. 199.

(11) Young, K.: Social Psychology. 2d edition. F. S. Crofts & Co., New York, N. Y. 1944. p. 387.

(12) Dietheelm, O.: Nosological position of panic reactions. Am. J. Psychiat. (N.S.) 13: 1295-1316, May 1934.

(13) Caldwell, H. G.: In an address, Propaganda and Mass Insecurity, sponsored by the Washington School of Psychiatry, the Army Medical Center, Washington, D. C., 7 April 1950.

(14) See p. 340 of reference footnote 11.



A flight-fear reaction in which prior cultural conditioning and current rumor played important parts was the panic during the battle at Adawa in February 1896 in which an action which involved about 15 000 Italian troops and nearly 100 000 Abyssinians. The terrain was rough and cut into deep parallel watercourses separated by steep ridges. An Italian unit advancing through one of these deep files was suddenly attacked by a small body of native troops and almost at the first brush the Italians turned tail and fled in disorder.

A number of factors contributed to this panic but the most important appears to have been the rumors about the cruelty and violence of the natives. All sorts of wild tales were told and retold about how the natives castrated (15) and tortured their prisoners. The stories made a deep impression on the men, and at the first contact with the natives there was an upsurge of fear which the officers and the suggestible soldiers were unable to check.

*Imitative behavior* contributes to panic. Imitation is a phase of individual learning and is a factor in the prior conditioning of persons which contributes to panics. Persons imitate the behavior of others and for the most part this imitative behavior is habitual and unconscious. People look when others look, laugh when others laugh, and run when others run. In imitation, there is a similarity in motor responses likeness in reactions due to likeness in stimuli and the deliberate or conscious taking of the role of another (16). The manner in which imitation, together with unfounded fear may contribute to panic behavior among soldiers is illustrated in an incident cited by Altrock (17):

As the regiment was trotting back in marching column on the road the regimental commander rode at the head of the column being it to walk. As this officer was galloping along from the direction of the enemy his pace was regarded as a sign of the seriousness of the situation. When the officers tried to gain the heads of their troops by galloping the troopers followed suit and soon the entire regiment was galloping away from the enemy and overran a Prussian battery. Only after miles and some casualties was it possible to bring the regiment to halt.

An imitative behavior response caused great numbers to die in the Iroquois Theater fire in Chicago on 30 December 1903. A account of the panic during the fire is quoted by LaPiere (18):

The theater itself never burned—they could have given performances in it a couple of days afterwards. But it didn't have time to burn to kill hun-

(15) It may be reasonable to draw an analogy between the castration fears which added to the tension and insecurity of the soldiers prior to the panic stimuli and the unfounded fear which is believed to be widespread among the population, that an atomic attack will sterilize all the survivors. (Cf. also Needles A. M., Patterns of Panic. International Universities Press, Inc., New York, N. Y. 1950, pp. 47-48.)

(16) See p. 391 of *Science* footnote 11.

(17) Altrock, C. V.; *P. M. C. Infantry Journal Magazine* 57: 115, Aug. 1930.

(18) See pp. 438-439 (reference footnote 9).

deda. The people from the balcony were piled in the narrow arch at the head of the big gilt stairway—and already many of them must have been crushed to death. Many of those in the orchestra had mobbed the side doors which had never been inspected to see if they would open at all. And there was another jam at the main orchestra entrance.

In the Iroquois fire it appears that the majority of the members of the audience in panic mimicked the behavior of a few and attempted to escape only through several exits which had been reached initially. Mimicked or imitative behavior may lead to a panic pattern of inaction combined with what appears to be mass suicide. Along this line the behavior pattern of inaction and mass suicide in panic may be the result of acute depressive mechanisms (guilt and repressed hostility with introjection of resentment). (19) Collective suicide was the predominant panic pattern during the sinking of the *Lusitania* in 1915. LaPiere (18) said

On the *Lusitania* torpedoed in British waters on May 7, 1915, collective rather than individual suicide appears to have been the predominant panic pattern. Early in the course of the disaster a number of overfilled and badly launched life boats sank. This fact, combined with the fact that the ship leaned so much that the remaining lifeboats had to be launched either down the sloping side or out over the water, seems to have been responsible for the establishment of a refuse-to-leave-the-ship pattern. People huddled hopelessly along the rails until the ship sank. Of the 1,954 passengers, 1,189 drowned. The hero of the occasion was an 18-year-old boy under whose leadership a few lifeboats were successfully filled and launched.

Collective self-sacrifice is another result of imitative behavior during panic. A great deal has been written of the heroic behavior of the men who went down with the *Titanic* when she struck an iceberg. LaPiere, citing a report of the U. S. Investigation Committee on the Titanic Disaster, pointed out that the heroism of the men was produced by mimicry which led to the unnecessary death of hundreds through needless collective self-sacrifice (18).

Much was said at the time of the heroic behavior of the men who went down singing with the *Titanic*. On her maiden voyage in April 1912, this ship struck an iceberg and went down within 2 hours. Although the sea was calm, although few of the lifeboats were damaged in collision, and although 2 hours should have been ample time for the orderly filling and launching of them, only 700 passengers all told were taken off in boats which had a capacity of 1,176. Women were put to sea in undermanned boats and men went down with the ship.

*Suggestibility* contributes to panic. Crowds, groups, and audiences are highly suggestible and this factor may operate to create panics. According to Young (20), suggestion takes place when one person

(19) Drayer, C. S.: Personal communication.

(20) See pp. 391-392 of ref. trac. footnote 11.

induces a decision or act in another without the latter's use of logical reasoning. In fact the aim of suggestion is to get others to think or do something by stopping their critical habits. Probably there is no better example of suggestibility as a producer of panic than the Orson Welles broadcast on the invasion from Mars. The radio was used as the medium for inducing the suggestion, with the resultant panic (10). In those thousands of persons who were panic-stricken as a result of this broadcast, there was for them a loss of critical judgment. Suggestion is effective when persons can be induced to lose their ability for critical judgment. In his analysis of the panic created through the Orson Welles broadcast Cantril (21) stated that critical ability is an accurate description of the most important single psychological variable related to the panic reaction. This critical ability is not likely to be a simple innate capacity that some people have and other do not have. Its genesis in the individual is the result of a particular environment which has played upon his particular capacity. *Whenever critical ability could function we discover that it was complete insurance against panic behavior.*

In the analysis of the people who listened to the Welles broadcast Cantril found that more of those with little education believed the broadcast to be a fact than those with more education. He said only about half as many people with a college education as compared to those with grammar school training believed the broadcast was a news report. (22) The capacity to exercise critical judgment and thus resist suggestion appears to be related to a general capacity to distinguish between fiction and reality or the ability to refer to special information which is regarded as sufficiently reliable to provide an interpretation. (22) In panic resulting from the Mars broadcast, high education was not a guarantee against loss of critical judgment because there are many other variables in the total personality which influence behavior. Twenty-eight percent of the panic-stricken sample interviewed in Cantril's study were college educated (as compared with 36 percent with high school and 46 percent with grammar school education (22)).

In collective mental life the increased suggestibility of members of the group keeps the intellectual processes at a low level (23). No fact has been more strongly insisted upon by writers on the psychology of crowds than the low degree of intelligence implied by their collective actions. The least intelligent minds bring down the intelligence of the whole to their own level. The effect of numbers is greatly increased. All display a common emotion and speak with one voice. The crowd has then, if we are in its presence, a well-nigh irresistible prestige. Hence even the highly intelligent and self-reliant member of crowd is apt to find his critical reserve broken down. (23)

(21) See p. 127 of reference footnote 10. (Italics are ours.) (In connection with the effect of loss of critical ability on panic behavior, cf. also reference footnote 8.)

(22) See pp. 112 and 117 of reference footnote 10.

(23) McDougall, W. *The Group Mind*, Cambridge University Press, Cambridge, Mass., 1920, p. 41.

Rumor contributes to panic. One of the most effective means of creating panic is through the diffusion of rumor—by word of mouth, telephone, newspaper, or radio. Combined with the strong element of suggestibility which exists in collective mental life, rumor can produce panic of major proportions. Meerloo (24) gave an example of the manner in which rumor caused panic among German troops in Holland which led them to attempt a retreat from that country.

"When the victorious Allies swept along the coast of Belgium and liberated Brussels and Antwerp, a few advance troops crossed the frontier into Holland. Because of confusing radio reports from London all kinds of wild rumors were in the air. Neighbors told each other about the liberation of Dordrecht and Rotterdam. The Allies were nearing. People displayed their national flags, children danced in the streets, they wore their national color (orange) and sang their national hymns again.

"The Nazi occupiers blocked all telephone communications—they had been affected by the rumors—and on the same day the German troops started their panicky retreat to the German frontier. The shops sold all kinds of liberation ribbons. For one day Holland was without enemies. \* The Germans' retreat, however, was violently stopped by their own army in Germany.

The rumors which caused the panic among the German troops in Holland are also referred to as hope or pipe dream rumors spread by the members of the population because it made them feel happy (25).

Rumor to spread panic among enemy forces was used by the Genghis Khan, who depended on rumor to spread accounts of the huge numbers of his troops and their ferocity. He did not care what the enemies thought as long as they became frightened (26). Through rumor, he was able to induce panic among numbers of opposing armies and weaken or completely dissipate the strength of the opposition.

A good example of the manner in which rumor may set off panic or disruptive mass behavior in the civil population is available from an analysis made of the Detroit race riot previously referred to. A long period of mounting tension among the Negro and white population was behind this riot, but rumor was the immediate or specific cause of the explosive uncontrolled behavior which resulted in the hysterical looting and beatings which led to the death of 34 people, the wounding of more than 1,000 and the destruction of hundreds of thousands of dollars worth of property. A rumor was circulated among the Negroes, beginning with an announcement over the public address system by an entertainer at a Negro night club who urged the 500 patrons to take care of a

(24) Meerloo, A. H. P. *Items of Panic*. International Universities Press, Inc., New York, N. Y., 1950, p. 9.

(25) For discussion of this concept, cf. Subcourse 30-41c, Lesson 3 "Extension Course in Command and General Staff College, Ft. Leavenworth, Kans., 1 Jun 1949.

(26) Lindeberger, P. M. A. *Psychological Warfare*. Combat Forces Press, Washington, D. C., 1948, p. 15.

bunch of whites who killed a colored woman and her baby at Belle Isle park. (27) A popular version of the rumor which was spread was to the effect that white men had thrown a Negro woman and her baby into the river. Then it started. By 4 a.m. 400 stores owned by whites in the colored district had been wrecked, looted, pillaged and destroyed. A street car had been stopped and 50 white factory workers were taken out and beaten. It was 5 a.m. before the whites started to retaliate. (28) The version of the rumor which set off the white population to riot was that Negroes had thrown a white baby off a bridge. Other versions were that two white women were attacked by Negroes on a bridge and that white girls were attacked by Negroes while swimming. (29)

Another example of the development of rumors in community disasters is cited by Hanson (30) in his report of the effects of the ammunition explosion at South Amboy, N. J. which occurred on 20 May 1950. He found that many spontaneous rumors began immediately after the explosion and that these rumors developed simultaneously in different places. The rumors which circulated included those which were to the effect that another explosion was pending; that an atomic bomb had struck the community; and that there might be poison gas coming from the chemical works.

*Fear of the unknown* contributes to panic. Lack of knowledge about natural and social phenomena is believed to contribute to panic behavior. Today, a total eclipse of the sun is not likely to produce panic but before the rise of astronomy such an eclipse could produce a major crisis among people. (31) Interesting examples of the manner in which fear of the unknown (lack of knowledge of natural phenomena) caused panic in the Martian invasion of the Welles broadcast were given by Cantrell (32). A northern New Jersey housewife described her reactions as follows:

I knew it was something terrible and I was frightened. But I didn't know just what it was. I couldn't make myself believe it was the end of the world. I've always heard that when the world came to an end it would come so fast nobody would know—so why should God get in touch with this announcer? When they told us what road to take and get up over the hills and the children began to cry, the family decided to go out.

A woman in a New York suburb described her reactions to the Welles broadcast as follows:

I never hugged my radio so closely as I did last night. I held a crucifix in my hand and prayed while looking out of the window for

(27) See p. 27 of reference footnote 5.

(28) See p. 21 of reference footnote 5.

(29) See p. 20 of reference footnote 5.

(30) See P. R. Preliminary Report on Psychiatric Investigation of South Amboy Explosion, unpublished report, Psychiatry and Neurology Consultants Division, Office of the Surgeon General, Department of the Army, Washington, D. C., May 1950.

(31) See p. 438 of reference footnote 9.

(32) See pp. 47-48 of reference footnote 10.

falling meteors. I also wanted to get a faint whiff of the gas so that I would know when to close my window and hermetically seal my room with waterproof cement or anything else I could get hold of (33)

The panic reactions of an entire family group to this broadcast was described by one of the members of a family living in a small midwestern town as follows:

That Halloween Boo sure had our family on its knees before the program was half over. God knows but we prayed to Him last Sunday. It was a lesson in more than one thing to us. My mother went out and looked for Mars. Dad was hard to convince or skeptical or sumpin' but he even got to believing it. Brother Joe as usual got more excited than he could show. Brother George wasn't home. Aunt Grace a good Catholic began to pray with Uncle Henry. Lily got sick to her stomach. I don't know what I did exactly but I prayed harder and more earnestly than ever before. Just as soon as we were convinced that thing was real how pretty all things on earth seemed how soon we put our trust in God (34)

In the examples given above panic was produced because critical judgment was dissipated. The lack of knowledge of the phenomenon described in the broadcast made it impossible for these people to cross-check with reality and they succumbed to panic behavior. There is always a danger of panic when mysterious new weapons are introduced because the unknown potentialities of the weapon cause fear. Levi quoted by Meerloo (35) described a wave of panic which Levi observed among the people of Paris because of the fear of mysterious new weapons:

I was in Paris on September 1, 1939 when Hitler's armies were marching across the plains of Poland and a formal declaration of hostilities was expected from one moment to the next. The city was swept by a wave of panic greater than anyone can imagine who did not see it with his own eyes—a vague shadowy terror which was due only in part to the concrete fear of mysterious new weapons such as poison gas and asphyxiating bombs.

The potential panic producing possibilities of the atomic bomb were suggested by Tazuki (36) who stated that at the moment of the explosion of the atomic bomb darkness and confusion suddenly spread . . . its terrible scene could never be expressed by either tongue or pen.

Lack of preparation contributes to panic. People may revert to panic behavior in times of crisis or disaster when they have not been pre-

(33) See pp. 49-50 of ref. enc. footnote 10.

(34) See p. 48 of reference footnote 10.

(35) See p. 49 of reference footnote 24.

(36) Tazuki, M.: Report on the Medical Studies of the Effects of the Atomic Bomb. General Report, Atomic Bomb Casualty Commission, National Research Council, Washington, D. C., Jan. 1947, p. 76.

pared to react in a more positive or fruitful manner. Young (37) stated that previous conditioning determines very largely though perhaps not entirely what we do. He said:

even in temporary crowd responses the apperceptive accumulations give a direction to our responses. These internal factors may be largely in the nature of highly charged emotional attitudes and responses but nevertheless the predispositions of the individual are important in his reactions. The writer once witnessed the varied responses of a theater audience when a fire broke out. Most of the spectators made a rush for the doors but a former fireman in the audience reached one set of doors ahead of the others and threw his weight against the crowd in an effort to hold the doors closed. There was great excitement until he shouted a few orders. The vast majority driven by natural fear ran from danger as rapidly as possible but the fireman's training had set up a set of predispositions which cut across his own natural impulses and caused him to act for the ultimate safety of the group. His apperceptive background produced calmer and more rational responses whereas those of the others rested on prepotent tendencies to flee from danger.

Dr. Barbara J. Betz (38) stated that previous training asserts itself when people react to a disaster situation and that their prior training will govern the behavior pattern to a large extent. She said that after the initial anxiety resulting from an atomic raid has passed off previous training will assert itself and people will tend to do whatever they know best or what they have been told to do beforehand. "Doctors for example begin to doctor ministers administer mothers mother their children and policemen direct traffic."

Davies (39) reporting on the usual air raids of Barcelona in 1938 stated that widespread panic of 1.5 million people for 40 hours because the air raid (from 6 bombers) were entirely unexpected. No preparation had been made for the raids and no instructions had been given to the people prior to the raid. He stated that 26 minutes of visits from half a dozen bombers themselves scarcely in danger destroyed the whole mental life of a 1.5 million people for 40 hours. In this connection Marton (40) said that "being caught unaware is a major cause of panic therefore the truth about everything must be told and accepted. The effectiveness of fire drills in eliminating panic among school children is well known. Training of soldiers reduces their susceptibility

(37) Young, K. J. Social Psychology: an Analysis. (Social Behavior F. S. Croft & Co., York, N. Y. 1930, pp. 318-319)

(38) On March 31, 1950 in an address entitled Psychological Effects of Atomic Warfare, delivered at Johns Hopkins University School of Public Health at courses are noted by the American Foreign Committee and National Security Resources Board. Cf. also The Evening Sun (Baltimore) April 1, 1950, and The Sun (Baltimore), no date.

(39) Davies, L. J. Armageddon: The Technique of Selective Approach, G. Routledge, London, 1942, p. 34.

(40) Marton, A. R. Prevention of panic. Med. Hyg. 26: 546-553, Oct. 1942.

to group panic in times of major stress. Pew (41) stated that the fact that untrained men are more susceptible to panic suggests the means of control.

Lack of preparation as a cause of panic means also failure to provide adequate leadership in the event of a possible disaster. In a disaster unless \* leadership operates the collective behavior will be panic in type (42). The chaos resulting from the Texas City Disaster might have been avoided had there been coordinated leadership. Annex I of the Sixth Army Disaster Relief Plan (4) stated that local sources were inadequate to cope with the situation; 40 percent of the city's residents had fled or were fleeing the city and general chaos resulted. In connection with the explosion of the S S *Grand camp* at Texas City this report pointed out that this disaster clearly demonstrated the need for a definite policy in meeting disaster on the Army level and the need for planning with civilian agencies and the Red Cross. The need for coordinated leadership in preventing panic is stressed here as an element of preparation which is necessary to control or minimize panic behavior in the event of atomic attack.

*Strong sensory stimuli* contribute to panic. In a disaster people may hear the loud noise, smell objects burning, and see people running. These sensory stimuli heighten excitement and contribute to panic behavior. Auditory stimulus is discussed here because it contributes greatly to panic behavior and because it suggests a method for conditioning the population and minimizing panic. Schildberg (43) describing British experience stated that auditory impressions in war exercise the strongest effect of all on our nerves. The whistling of falling bombs, the sounds of their explosions, and the boom of the anti-aircraft guns mingle in the inferno of noise with shattering effects on the nerves. On top of this comes an auditory illusion, repeated explosions suggesting that the danger is coming closer. In the Gallic War Julius Caesar's enemies recognized the value of auditory stimulus in creating panic and confusion among Caesar's legions by yelling and knocking their weapons together to produce loud and fearful noises.

That Hitler's generals recognized or at least used auditory stimuli in creating fear among the civilian population was suggested by Schildberg who stated: "I am told that when Vienna was occupied last year the intimidation of the populace was effected by the deafening roar of low flying squadrons of aeroplanes; indeed, that many persons found themselves paralyzed by it." (43). A more recent example of noise significantly adding to the confusion of a community disaster was reported by Hanson (30) in the South Amboy explosion. During the period immediately following this disaster fire trucks and other cars equipped with sirens raced around town apparently aimlessly with their sirens going and this added to the confusion.

(41) Pew, W. *As Making a Soldier*. R. G. Badger, Boston, Mass. 1917, p. 196.

(42) See p. 458 in reference footnote 41.

(43) Schildberg, W. *Treatment of panic in a salty area and clearing station*. *Lif and Letters Today* 23: 162-169, Autumn 1939.



pared to react in a more positive or fruitful manner. Young (37) stated that previous conditioning determines very largely though perhaps not entirely what we do. He said

even in temporary crowd responses the apperceptive accumulations give a direction to our responses. These internal factors may be largely in the nature of highly charged emotional attitudes and responses but nevertheless the predispositions of the individual are important in his actions. The writer once witnessed the varied responses of a theater audience when a fire broke out. Most of the spectators made a rush for the doors but a former fireman in the audience reached one set of doors ahead of the others and threw his weight against the crowd in an effort to hold the doors closed. There was great excitement until he shouted a few orders. The vast majority driven by natural fear ran from danger as rapidly as possible but the fireman's training had set up a set of predispositions which cut across his own natural impulses and caused him to act for the ultimate safety of the group. His apperceptive background produced calmer and more rational responses whereas those of the others rested on prepotent tendencies to flee from danger.

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(37) Young, K. *Social Psychology as Analysis* (Social Behavior, F. S. Craft & Co., N. York, N. Y. 1930, pp. 518-519).

(38) On March 31, 1950 in an address entitled *Psychological Effect of Atomic Warfare*, delivered at Johns Hopkins University School of Public Health at a course sponsored by the Atomic Energy Commission and National Security Resources Board. Cf. also *The Evening Sun* (Baltimore) April 1, 1950, and *The Sun* (Baltimore), same date.

(39) Davis, L. *Air Raids: The Technique of Silent Approach*, G. Routledge, London, 1942, p. 34.

(40) Martin, A. R. *Prevention of panic*, *Ment. Hyg.* 26: 346-353, Oct. 1942.

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(41) Pew, W. A.: *Making a Soldier*. R. G. Badger, Boston, Ma., 1917, p. 196.

(42) See p. 458 in reference loc. cit. 41.

(43) Schmidberg, W.: *Treatment of panic* in casualty area and clearing station. *Lit and Letters Today* 24: 162-169, Autumn 1939.

## PREVENTION AND CONTROL OF PANIC BEHAVIOR

Although knowledge of the causes, prevention, and treatment of panic is far from complete and much research need to be done (44) there is enough available information to provide a tentative approach to the problem. The prevention and control of panic behavior resulting from an atomic explosion or other disaster involve a multiple approach. Among factors to be considered are organization, education, leadership, and motivation.

Organization —The American Medical Association film "They Also Serve" is a good introduction to preliminary planning. The following general civic functions must be maintained and must continue to operate in the face of confusion, disorganization, and partial destruction:

1. Communication
2. Police
3. Fire
4. Engineering to include removal of debris or other hazards
5. Transportation
6. Rescue and first-aid services
7. Medical and health services.
8. Sanitation.
9. Evacuation of population if indicated.
10. Human welfare to include shelter, food, and information to disaster victims
11. Radiologic defense
12. Chemical warfare defense

Specific attention and special measures are needed for 11 and 12.

Within the framework of planning for the defense of the civilian population there should be organized activities in each community by neighborhood, down to each person who has a specific role to play in some phase of an activity. Organized activity promotes discipline and control and, as a result, there will be less likelihood of confusion and explosive mass-behavior in the event of a disaster affecting the community. Planning should not end with the organization of a single community as an isolated unit, because in the event of mass disaster cities should be able to support one another and even larger divisions or geographic regions of a country should be prepared to act cooperatively. In the development of cooperative civic ties between cities, some will be identified as friendly to each other while others will be categorized as rivals. The attitude of friendliness and rivalry might be used in the defense planning by having one friendly city aid the population of another friendly stricken city and by urging the populations

(44) U. S. Air Force Project Rand: Proposals for Field Research on the Psychological Impact of Proximity Bombers. Also, Research Planning. The Rand Corporation, Santa Monica, Calif., Jan. 1942.

of rival cities to excel each other in their respective defense activities (45)

Education.—One of the major causes of panic is fear and fear of the unknown promotes disorganized behavior. Education and knowledge diminish the threat of unknown or fantastic dangers. That which is known can be planned for; if unknown the threat is the more powerful in that there can be no effective planning for security or survival. Therefore sound, basic and factual knowledge of potential dangers should be made freely available. If the critical judgment of people can be increased panic behavior can be prevented or minimized in the event of atomic attack. Cantril (46) said: "And education we discovered was one of the greatest preventives of panic behavior. Through education of civil groups the tension and insecurity which may be building up among the population can be minimized. If there is an organized, systematic and effective educational program critical judgment will be increased, fears of the mysterious and unknown can be dispelled and a means for cross-checking reality can be provided which will make the group less susceptible to rumor."

Because we may expect imitative behavior to take place in group interaction following a major disaster a plan for panic control needs to embody plans for training persons and groups for specific leadership so that imitative behavior can be turned into constructive action instead of fearful flight. The educational program can serve the purpose of dissipating lack of preparation as one of the major causes of panic. If the program is effective each person will be prepared to some degree for the disaster should it occur. Simple factual knowledge is contained in table 1.

Information should be made available on fear and how people react to fear. Fear is a common normal reaction in the face of danger and verbal expression of fear is permissible. Uncontrolled fear engenders infantile types of behavior: passivity, apathy, even a denial of the presence of danger or explosive behavior, fury, or a blind desire for escape. Even death may occur solely as a result of extreme fear. On the other hand, wolf! wolf! techniques may make a population apathetic. Constant and repeated raising and lowering of levels of emotional tension may render people indifferent and listless and foster lessened susceptibility to panic behavior. Such populations would also be less efficient and productive as well.

Information on the harmfulness of rumors (47) should be widely disseminated. Rumors spread with incredible rapidity can disrupt military or civilian morale and promote friction between groups and even nations. Rumors may be expected when the subject is important and when

(45) See also U.S. Unpublished data.

(46) See p. 204 for reference footnote 10.

(47) Department of the Army: What's the Last of Rumor? Armed Forces Talk 224 Washington, D. C.

TABLE 1.—*Air bursts / atomic bomb (1)*  
WHAT HAPPENS

Physical activity	Percent of casualties	Effects	Evidence
Blast	65	Positive phase (pushing out)	Pressure out from burst. Usually not enough to kill. Flying debris causes most all injuries.
		Negative phase (sucking in)	High winds up to 100 miles per hour. Blows toward center of burst and up into cloud.
Heat	20	Flash heat	Flash—the time of burst. Burns occur out to 2 miles. Light clothes or by shielding substance. Head protection.
		Secondary fires	Started by stores, short circuits, et cetera. Cutting off utilities will prevent these fires.
Radiation	15	Flash radiation (gamma rays and neutrons)	Cannot be seen, heard, or felt, but it is there for flash. Gamma rays are most penetrating and have longest range. The more material between you and the blast the greater the protection. Gamma radiation decreases the square of the distance from the burst.
		Lingering radiation (alpha and beta particles)	So small that it is not hazard. Don't guard it.

## WHAT TO DO

Disperse	If warning is given get away from possible target areas and areas that are built up to avoid the flying debris.
Take cover and stay for about 90 seconds.	Use basements or underground shelters if possible. Get close to the concrete walls and near good exits from basement first burst. Remember get the most material between you and the burst.
Help others	Thousands of lives can be saved by prompt aid. Help save lives by helping others 90 seconds after burst the debris has stopped falling and there is no radiation hazard.
Report designated place	Organization is necessary to reduce the effects of the bomb. Report to receive treatment if necessary; to be evacuated if desirable; and to work to help others.
Don't eat, chew, drink, or smoke until items are checked and cleaned.	A small amount of radiation outside the body is harmless. Inside the body it may cause much trouble. Keep it out.
Don't spread rumors.	Things will be tough all over. Keep your eyes on yourself and don't listen on what you hear from others.
Scrub down and change clothes.	A soon practicable scrub down and change clothes. Scrub hair, face, hands and fingernails well.

(1) From classified material provided by the Armed Forces Special Weapons Project and first published in an article "Medical Planning for Atomic Disaster" by W. L. Wilson, in the Journal of the Florida Medical Association, Oct. 1950.

there is uncertainty about the facts. Although some rumors may be deliberately started, most rumors begin from a modicum of truth that is elaborated distorted misinterpreted mangled and constantly magnified with each retelling. Rumors provide answers for questions that need answering they offer excuses for actions they relieve emotions and perhaps most important of all they make the teller feel important. In general rumors may be classified as *fear wish* or *bate* rumors. Of these the hate rumor is the most widespread and vicious. Rumors can be stopped by getting the facts by finding out who said it and the authority for it by being skeptical by ridiculing and by being on the alert for rumors and labeling them as such.

There should be information on mental health and mental first aid under disaster conditions. For example Tyhurst (48) as the result of his observation of people believes that there are three reaction periods in disaster situations:

- 1 The *impact period* lasts during the emergency or danger situation itself. The behavior of the people may be confused disorganized, and panicky. It may also be of a semiautomatic nature. In the face of emergencies persons may as though in a trance calmly proceed to perform more or less aimless or otherwise useless acts. Well known is the tendency for an occupant to take say an umbrella from a burning building and leave clothing money or other valuables behind or to pass by a fire extinguisher while looking for a bucket to carry water. Intensive training promotes prompt and efficient reactions to emergencies but the training must be so ingrained that responses become habitual or automatic and take precedence over more primitive forms of automatic behavior.

- 2 The *recoil period* follows immediately after the impact period and may last for from several hours to a day or more. Persons may show apathy childish dependency or hostility to other survivors or to those who attempt to help them. A need may be shown for scapegoats.

- 3 The *post traumatic period* is characterized by the development of more easily recognized types of psychoneurosis, psychosomatic symptoms or delinquent behavior patterns.

Knowledge regarding types of mental reaction under extreme stress and principles of treatment as outlined in *Combat Psychiatry* (49) may well be helpful in the planning for civilian groups inasmuch as the front line may be in the civilian community itself under conditions of aerial or atomic attack. Everyone should be well informed regarding physiologic and psychologic symptoms that may be manifested as the result of continued severe stress and/or fear.

- 1 *Normal psychologic reactions* to severe stress and/or fear may include irritability insomnia, heightened sensitivity to loud or un-

(48) Tyhurst, J. S. Unpublished data.

(49) *Combat Psychiatry*. Bell, U. S. Army M. Dept. (supp.) 9 Nov 1949.

expected noises whereby more or less automatically a person becomes tense and is prepared to react promptly to the face of danger or threat—a sort of on-guard reaction reminiscent anticipatory anxiety that gradually increases in the face of recurrent or increasing danger; loss of interest; inability to mental concentration, and increased dependence on others.

2. *Normal psychosomatic reactions to severe stress and/or fear* include generalized increased muscular tension (person feels as though he has "tightened up"); tension headache; momentary inability to react or respond to danger; the freezing, shaking and tremor; excessive perspiration; chilly or hot sensations; loss of appetite; vague abdominal distress; diarrhea; frequency of urination day or night; rapid pulse; breathlessness; consciousness of irregular heart beating; sense of oppression in the chest; faintness and giddiness; generalized muscular weakness and lassitude; and marked physical fatigue.

3. *Abnormal reactions to severe stress and/or fear* include grossly incapacitating shaking and tremors lasting for hours after the immediate danger is over; fainting under stress; oversensitivity to non-specific noises unconnected with the source of danger; continued insomnia after the immediate danger has passed; the presence of gross functional impairment such as paralyses, contractures, blindness, deafness, i. e. conversion hyster; pseudopsychotic reactions; continued depression and guilt feelings; pathologic fear such as panic with clouded consciousness and disorganization of thinking and control.

Leadership—A factor directly related to the quality of leadership. When leadership is competent morale, efficiency, discipline and productivity are high, and tendency to panic and disorganization are lessened. The best leaders in times of stress are not necessarily those who are best under more peaceful conditions. Some specific population leaders needed to be available in times of emergency may be identified by ascertaining those persons in community whose advice is sought by other members of the community and whose views are respected. Such potential leaders are often relatively inconspicuous, unassuming, and retiring. It is important in group management, for leaders to isolate subversive or destructive persons (primary reactor) who are instigators promulgating undesirable and potentially explosive mass behavior reactions. Often such persons are unobtrusive, difficult to identify, act behind-the-scenes operator and set in motion other person (secondary reactors) of whom only the latter may be obvious and prominent in their disturbing activities.

Qualities demanded of leaders have been outlined by a number of military and civilian writers with variable conclusion. Lee (50) studied the problem of leadership from the viewpoint of the follower in a civil industry. Important points are

1 To be a leader one must be followed. A follower will not follow another simply because that person wishes him to follow. Unless the follower believes he will benefit in following another he will not follow. Pressure, titles and authority cannot and will not force him to follow.

2 The prospective follower wants a leader who (a) is not afraid of his job, for his job, or of someone who threatens his job, or of competition, or of honest mistakes; (b) is enthusiastic; (c) believes the job is important; (d) will fight for him at all costs if he believes him to be in the right; (e) will keep him informed; (f) will recognize him as a fellow human being; (g) will listen to him and understand him; (h) respects his pride and never under any circumstances or provocation bowls him out in the presence of others; (i) knows most of the answers but will admit it if he doesn't; (j) is predictable; and (k) is fair.

The quality of fairness expected of leaders is exemplified by the usually orderly and good-natured sugar-ration lines in this country during the last emergency. Everybody got the same amount of sugar and no favoritism was shown. On the other hand, gasoline ration lines were frequently disorderly and some people got more gas than others.

A leader becomes ineffective if he cannot communicate with his group. Therefore it is important to maintain a communication system capable of providing accurate information or directions under any and all conditions. Reporters over such systems of communications should have calm, flat, unemotional voices. Sensationalism is to be avoided and the flash, rumor method of reporting may become quite disruptive. Information should be factual and rumor, speculation, or unverified data avoided. It should be realized that destructive rumors and conflicting directions may be spread by subversive agents if such agents are able to seize control of the official information service or the communication network.

Motivation—In spite of difficulties, deficiencies and obstructions, persons and groups succeed in goals and objectives if they have the will to do so. MacLean (51) has pointed out the importance of the ethical conscience of a people as related to courage, fortitude, endurance, loyalty, trust and honor but as Marshall (52) noted, it is impractical to base any policy on exaggerated notions of man's capacity to endure and to sacrifice on behalf of ideals alone. The basic needs of man, and hence his motivations, have been listed as hierarchies by Maslow (53). Man is a wanting animal and as soon as one need is filled another takes its place. Nonetheless, needs or motivations occur in a certain priority which may vary from person to person. In general, needs take precedence as follows:

(51) MacLean, A. R.: A disease. *Canad. M. A. J.* 56: 321-324, Mar. 1947; also, *Canad. J. Pub. Health* 38: 243-248, May 1947.

(52) Marshall, S. L.: *Act Men Against Fire*. Wm. Morrow & Co., Inc., New York, N. Y., 1947.

(53) Maslow, A. H.: Preface to motivation theory. *Psychosom. Med.* 5: 85-92, Jan. 1943. Theory of human motivation. *Psychol. Rev.* 50: 370-396, July 1943.



1 *Physiologic needs.* Satisfaction or gratification of basic physiologic (hunger) and sensual needs. Purely physical needs. Margaret Meade has stated that much information on feeding mixed ethnic groups has been accumulated. In such feeding no foods should be mixed. For instance no milk should be put in anything. Milk should be in a pitcher. Seasoning should not be added but placed in separate containers to be added on individual preference. All food elements should be pure and mixed or added as different ethnic groups find it necessary. If foods are mixed no matter if fortifying or nutritive they may be refused because of group prejudices. In times of stress food quiets anxiety. This is one reason for preference in quality and quantity being put into food for submarine crew. In panic situations affecting Americans it would be highly desirable to have food available in large quantities. Specific articles of food are sometimes necessary and are required for their moral or other value over and above any nutritional requirement. For example coffee, tea, sugar and tobacco. Onions were critical for use by British housewives. Their food was so tasteless that it required onions to make it edible.

2 *Safety needs.* Insurance against physical danger to life, overwhelming threats and the need for an organized, reliable family and manageable world.

3 *Love needs.* Love, belongingness, acceptance, place in the group, both giving and receiving affection (sex needs may be added).

4 *Esteem needs.* Self-esteem, self-respect, self-confidence, respect from others, prestige, appreciation, achievement, adequacy and independence and freedom.

5 *Self-fulfillment.* Self-expression, full use of capacities, social ideal of justice, freedom, order, full information and desire to learn, know and understand in broadest sense.

Behavior typically has more than one motivation and causality is multidetermined. It would be a mistake to assume that all our motivations are biologic in nature and based solely on love (including self-preservation) and hate. Personality is influenced by both innate drive and influences from without in the social as well as the personal or immediate environment. Behavior is bio-psycho-socially determined in the matrix of innate drives or inner disposition as shaped by the coincidence of social opportunity (54). Stability or instability of the individual personality and hence of group is related to level of tension and anxiety as generated in family relationship, child rearing, educational system, industrial practices, social customs, economic status, religious tensions, personal liberty and civil rights, prejudices and intergroup and international tensions.

(54) GAP Report No. 13:1 The Social Responsibility of Psychiatry. Statement of Organization, July 1950.

At the same time prevailing attitudes must be carefully considered. Attitudes are related to performance and nonverbal behavior (55). If World War I demonstrated the importance of the proper use of aptitudes then World War II demonstrated the importance of attitudes in predicting performance and behavior. The central orientation of the American character is self interest to the point of domination of all other values; authority and its corollary discipline are given low values the American has ideals of self initiative independence individual freedom in religious economic and political affairs and success through personal endeavor and intense individual competition (56). On the other hand group solidarity is valued highly as witnessed by fraternities sororities clubs fads or keeping up with the neighbors. The identification of a person with a group as his own (the belief that the group is responsible for him and he for it) is one of his strongest supports in time of stress (52). The things that induce a man to face life bravely are friendship Loyalty to responsibility and knowledge that he is the repository of the faith and confidence of others "

### CONTROL OF GROUP PANIC

In planning for the defense of population groups the possible development of panic must be assumed and plans for its control must be developed. Prevention will be the best control. Preventive measures will be essentially those which are necessary on a greater scale for control of overt panic once it has started. Prevention and control of group panic is a function of central authority (especially of the police and peace officers). Physicians and psychiatrists in staff relationship to such authority will act in an advisory capacity.

Evacuation of persons or sections of populations after an enemy attack will entail psychologic dangers. In support of this statement it is well known among military authorities that evacuation of troops in the face of enemy action must be carefully controlled because it carries with it the danger of group panic. Troops must be carefully informed as to why they are being evacuated and how and where the new line of resistance will be established. As has been suggested earlier unexplained unexpected rearward movements of even a few men can cause a rout even among good troops. By analogy after disasters affecting civilian populations resulting from enemy action evacuation should be de-emphasized and strictly controlled. Any but the most carefully regulated and disciplined evacuation will tend to disrupt transportation clog roads dissolve group and family ties and tear persons away from any useful group role in disaster control and restoring the community.

Group panic involves unreasoning uncritical and undaptive movement of groups toward escape from danger. Suggestibility is high abil

(55) Woodell, G. S. A., et al. The American Soldier V Ia. I and II. Princeton University Press, Princeton, N. J. 1949.

(56) Spindler, G. D. American character as revealed by military Psychiatry 17: 75-281, Aug. 1948.

ry critically to assess reality is low and the danger of imitative response to apparent escape patterns is great. A panicked crowd is a disorganized herd usually without leadership and with only a vague unplanned aim of escape from danger. Fortunately panic groups fatigue and after a period of concentrated emotional upheaval and group motion, the members of the panic group can be diverted or dispersed. Then under strong leadership integrating group mechanisms and influence can be invoked, and panic brought under control. These considerations make it advisable to establish road blocks along routes of egress at intervals from the center to the periphery of an affected community. Single persons, groups of persons, and vehicles moving outward in an unplanned and unauthorized manner should be diverted into areas suitable for assembly of large number of persons and vehicles.

At such assembly points accurate information as to the nature and the extent of the attack and the resultant damage should be broadcast. Able-bodied persons should be formed into groups and dispatched back to the damaged areas to aid in rescue work. In the case of atomic bombing (high level attack), it should be made clear that the danger from residual radiation is nil and that the danger of a repeated attack is also nil. Persons who have escaped gross injury should be informed that the attacked city is now relatively safe spot. Emphasis should be placed, in such broadcast, on the job remaining to be done in rescue work, fire-fighting, and the re-establishment of the community. There should be provision for feeding the collected group. Persons manning assembly points should be specially trained and suitable for leadership in potentially confused situation. They should be capable of speaking effectively to groups and of imparting information and commands.

### TREATMENT OF THE PSYCHIATRIC CASUALTIES RESULTING FROM A GROUP DISASTER

A soundly conceived program for treating the psychiatric casualties will contribute to the stability of community under enemy attack. The treatment program should reinforce imitative group mechanisms and insure that individual panic reactors are placed under treatment. The clinical course and prognosis of psychiatric casualties of disaster

involving civilian populations will be strongly influenced by group and social mechanisms (as has been true in the combat neuroses). Administrative and organizational policies should be planned to prevent indiscriminate evacuation, crystallization of neuroses, and impairment of the morale and efficiency of the population. The plan for treating the psychiatric casualties of such a disaster probably should parallel that which has been developed for the care and treatment of military combat neuroses on the basis of World War II experience (49) (57) (58).

(57) Department of the Army: Training Circular No. 6, Sec. B Neuropsychiatric Casualties, Apr. 1950.

(58) Ransome, S. F. Psychiatric treatment in combat area. U. S. Armed Forces, 11, 137-139, Dec. 1950.

Definite channels for evacuation of neuropsychiatric cases should be established, emphasizing positive control of screening, treatment, and evacuation. Emphasis should be placed on treatment as close to the scene as feasible, shortening of the period of hospitalization, avoidance of unnecessary hospital atmosphere, and promotion in the patient of the expectation of rapid recovery and return to the population. In psychodynamic terms, treatment should be organized to (1) preserve the patient's identification with his community, job, and family; (2) minimize the secondary gain of neurotic illness; and (3) avoid suggestion of illness and disability. Therapeutic principles should thus be implemented by group manipulation.

Before any medical personnel see them, psychiatric casualties should receive what might be called psychiatric first aid from members of their own family and other nonmedical persons. If they enter medical channels, they should be first seen at casualty collecting points (stations roughly equivalent to Army battalion aid stations). Here simple but for many patients definitive therapy and disposition would be given. Casualty collecting points should be able to return a large percent of psychiatric casualties to the population with no further requirements for medical care. Those requiring treatment beyond the capabilities of the casualty collecting point should receive further evaluation and treatment at secondary or clearing hospitals (installations functionally resembling Army divisional clearing stations). Here, depending on the situation and the holding policy prevalent, from 20 to 60 percent of all patients should be returned to the population. Those requiring more extensive care and treatment should be evacuated to outlying (base) hospitals.

Psychiatric first aid administered by nonmedical persons should consist first of a common-sense "sizing-up" to determine whether medical care is necessary. In most cases the latter would be neither necessary nor desirable. Instead the wavering person should be supported by reassurance, leadership, and exhortation. In this way persons with relatively trivial reactions would be kept out of hospitalization channels where dissolution of group ties and the factors of secondary gain and suggestion of illness tend to promote lasting patterns of psychiatric illness. Formal medical treatment would be encountered first at the casualty collecting point. Physicians there in almost all instances would not be psychiatrists. It is believed, however, that simple measures well within the capabilities of any physician properly indoctrinated would make possible the return to the population of from 50 to 60 percent of psychiatric patients. Psychiatric management at this level would be of extreme importance. Treatment at the casualty collecting point can be discussed under (1) treatment of fatigue, exposure, and exhaustion, and (2) psychotherapy proper.

1. Most persons admitted to the casualty collecting point probably would exhibit mild to moderate anxiety reactions. Many also would

how effects of exposure and physical exhaustion. Consequently although the first brief interview might give the impression that many should be evacuated and hospitalized most of them probably would be sufficiently relieved of symptoms if they could be given sleep sedation, and food in the vicinity of the casualty collecting point for 24 hours. Sedation should be adequate. Probably 0.4 or 0.6 g. m. of amobarbital sodium orally or its equivalent in pentobarbital would be required. Every effort should be made to get casualty cleaned up dry and adequately fed.

2. *Psychotherapy* at this level would vary with the type of case and of necessity would be superficial. The attitude of the physician would be important. He should be understanding but firm. His decision should carry an air of calm confidence. His manner should indicate that he expects rapid remission of symptoms and return to the population. Every attempt should be made by proper organization and administration to prevent the casualty from becoming confused and crowded. Many patients would show symptoms which are essentially those of a fear reaction normal and consistent with the situation. The true nature of the reaction would often not be evident to the patient who would tend to misinterpret the psychological and somatic manifestations of the normal fear reaction and consider himself organically or psychiatrically ill. Physicians, however, must be prepared to evaluate the fear reaction correctly and set it into its proper context for the patient.

Although persons with such reactions may well consider themselves ill as result of misinterpretation of palpitation, nervousness, tremulousness, etcetera, and believe that they have developed heart disease, gastrointestinal disease, or some other physical disorder, such reactions are within the normal range of response to overwhelming fear and require no prolonged psychiatric treatment. Such patients will benefit by explanation and reassurance. In appropriate cases there should be brief but adequate examination of the pertinent organ system. If this is negative the patient should be told this promptly and decisively. The cause of the symptoms may be explained in brief simple terms. If the symptoms are carried through the first period of reaction it can be expected that their symptoms will subside. No disability will result and no formal psychiatric treatment will be necessary.

Patients with from mild to moderate anxiety reactions complicated by varying degrees of exhaustion and exposure should be treated chiefly by sedation and by measures to combat exhaustion and exposure as outlined above. Psychotherapy should be superficial and limited chiefly to reassurance, support, and exhortation. After 24 hours a great share would be completely recovered, or greatly improved and able to return to the population. Others, unimproved, or insufficiently improved, would require evacuation for more definite psychiatric care.

Certain patients would be unsuited for management at the casualty collecting point. Chiefly these would be those with (1) disturbed anx-

ity reactions associated with severe agitation and tension (2) acute panic states (3) marked hysterical manifestations and (4) acute psychoses. Such patients should be sedated adequately prior to evacuation. Most of them will have a much greater tolerance to the barbiturates than have average persons. The dosage of sedative would depend on the severity of the patient's reaction. Commonly it would be 0.4 or 0.6 gram of amobarbital sodium or its equivalent in pentobarbital. In general, it would be wise to allow sedation to take maximum effect before evacuating the patient. Care should be taken to avoid unnecessarily converting a walking patient into a litter patient by over sedation.

Treatment at casualty collecting points would involve (1) careful and realistic screening and classification of patients with evacuation of only those with severe reactions and manifestly in need of hospital care (2) treatment for as many patients as possible on an ambulatory basis (3) provision of measures at or near the casualty collecting point to relieve fatigue, hunger, and the effects of exposure (4) exhibition of an attitude of sympathetic firmness which expects recovery and return to the population of most patients; and (5) adequate sedation, for those patients in whom it is indicated.

If evacuated from casualty collecting points, psychiatric patients would be received at secondary or clearing hospitals. Treatment there can be discussed under (1) treatment of fatigue and exposure (2) alleviation of deprivations and (3) psychotherapy proper.

1 *Treatment of fatigue and exposure* —Although many patients may have received some previous treatment for fatigue and exposure at casualty collecting points, a large share may nevertheless arrive at secondary or clearing hospitals fatigued, hungry, dirty, and cold. For these, rest under sedation should be promptly instituted. Hot food and drink in copious quantities should be available. These patients should be placed on adequately heated wards under a sufficient number of blankets. Most should be given barbiturate sedation by mouth (see below).

2 *Alleviation of deprivations* —Patients should be given a clean change of clothing, a hot shower, and a chance to shave. Reading and writing materials should be at hand. Patients should be provided with such personal items as toothbrushes, shaving and other toilet equipment, and cigarettes. Welfare problems will be acute. Families will be scattered and separated. Patients will have lost their housing and many will have lost all their possessions. Red Cross and social work counseling and welfare services must therefore help these persons to adjust to their losses, securing information of personal nature and performing other services of a welfare nature. Hospital chaplains should be available for those who urgently need religious support.

### 3 *Psychotherapy*

a. *The patient-physician relationship and history taking* —The psychiatrist should combine respect and sympathy for the patient with

an attitude of firmness, realism, and decisiveness. The aim should be to allow no doubt to arise in the patient's mind that he is expected to regain relative emotional health rapidly and return to the community and his family to fulfill his role and duties. Within this context, the patient should be encouraged to tell his story. He should be "heard out." No matter what the pressure of the situation, the psychiatrist should avoid giving the patient the impression of having received a "brush-off." On the other hand, because of the highly suggestible state of the patients, leading questions should be avoided. If physical complaints are present, the organ system concerned should be carefully examined.

b *Ventilation*.—Allowing the patients to tell their stories and ventilate their fears, hopes, and resentments will frequently bring marked symptomatic relief. During such ventilation, the psychiatrist should remain a passive participant. In this way it will frequently be possible for patients to formulate and work through their problems with a minimum of direct aid.

c *Strengthening of group loyalty and identification*.—Victims of civilian disaster, like combat soldiers, will be supported in large part by group loyalties and sense of duty. Wavering persons should be helped to endure their misfortunes by invoking and strengthening the force of. In properly chosen cases, the psychiatrist should not hesitate to call on the patient's loyalties to his family, neighbor, and immediate working group. Call on loyalties to larger groups such as the nation, may perhaps be less effective.

d *Suggestion*.—Treatment should (1) avoid suggestion of illness and (2) employ positive suggestion to remove or alleviate symptoms.

Psychiatric treatment facilities will need and should have a minimum of the atmosphere of conventional hospital. As much as possible consist it with their medical mission they should resemble ordinary center for the reception of persons rendered homeless by the disaster. Except in the coldest of winter months, in the absence of all buildings, adequately heated tents will constitute acceptable facilities. Folding canvas cots would be acceptable in lieu of beds. Mattresses and sheets would not be necessary. There will be few persons who would be psychotic or require care on closed ward. Therefore special security features for the installation handling the psychiatric casualties of a civilian disaster would be unnecessary.

Patients should remain ambulatory and should not be wasted on. All possible steps should be taken to engender in the patient an expectation of early recovery. The psychiatrist should maintain an attitude of firm kindness, avoiding undue sympathy or overconcern. The examiner should employ neutral speech forms, avoiding leading questions, and allowing the patient to tell his story in his own way thus devel-

oping a full and complete story of the present illness. By making the appropriate systemic examinations promptly and avoiding unnecessary referrals for special examinations, consultations, laboratory and x-ray work, the psychiatrist will avoid suggestion of physical and psychiatric disability. Indecision, unnecessary referrals and "buck-passing" by unnecessary diagnostic procedures tend to fix the attitude of illness and invalidism in patients by suggestion and by increasing the secondary gain of illness. In the same way unnecessarily long stays in a hospital would tend to suggest continued and perhaps undiagnosed illness to the patient and should be avoided.

In the proper cases suggestion should be used in a specifically directed manner to eliminate hysterical symptoms such as tics and paraplegias. Used alone, however, it does not alter basic psychopathology and the symptom is likely to recur or be replaced by another symptom or by a wave of anxiety. Therefore it is best combined with techniques for uncovering repressed material, with abreaction, and manipulation of secondary gain. When thus used in combination with other tools suggestion can be of great therapeutic value.

*e Uncovering therapy*—In a significant portion of cases patients probably will exhibit amnesia for certain of the events associated with the disaster. Firm suggestion by the examiner that the patient can now recall his forgotten experiences may result in recovery of this material. In general, however, nonmanipulative techniques for recovery of repressed material will be too time-consuming and techniques using intravenous barbiturates (narcoanalysis or narcosynthesis) or hypnosis will be indicated. These techniques would be indicated in almost all hysterical reactions, with or without complete binding of anxiety. Patients with paralysis, tics, and hemitremors are almost certain to exhibit satisfactory results. Gratifying therapeutic results are also likely to be achieved in tense patients with retarded anxiety states in which a period of amnesia exists for traumatic events associated with the disaster.

*f Reassurance*—Because these patients will tend to be easily convinced that they are seriously ill, it will be important to reassure them decisively, after proper examination, that no serious physical illness exists. The patient also should be reassured concerning the magnitude of his psychiatric disability. In appropriate cases it should be stressed that the reaction being situational will be short-lived and should have no effect on the patient's permanent mental and emotional health, ability to work, or social or marital adjustment. It should be stressed that the reaction has no relationship to insanity. In general matters should be placed in their proper realistic proportions. On the other hand, empty expressions of confidence should be avoided.

*g Explanation*.—Many patients will derive great benefit from an understanding of the cause of their symptoms. An explanation of



the normal fear reaction with its psychologic and somatic symptom complex will aid many of them.

*h. Manipulation of secondary gain.*—As in military psychiatry it is probable that the secondary gain of neurotic illness will be an important factor in causing and perpetuating psychiatric disabilities after a disaster involving civilians. Illness will tend to "pay off" by removing the patient from discomfort and possible danger and placing him in the relative ease and safety of a medical installation. Psychiatrists should attempt to neutralize this factor to the greatest extent practicable.

*i. Sedation* should be individualized. On admission, each patient should be seen briefly for a screening interview. Tense and anxious patients, evacuated from the disaster scene only minutes or hours before, should be given adequate sedation. This will have as its aim the production of one full night's sleep. From 0.4 to 0.6 gram of *mobarbital sodium* or its equivalent *i pentobarbital* should be given. In certain patients sedation should be continued throughout the following day using 0.2 gram of *amobarbital sodium q. i. d.* or its equivalent. Continuous heavy sedation should not be employed in most cases because it tends to produce barbiturate intoxication and produce or heighten disorientation. No further medication should be given to patients who have received adequate sedation elsewhere. Sedative medication should usually not be given to persons who have experienced only minimal stress. Except occasionally in managing psychotics, intravenous sedation will be seldom advisable.

*j. Measures designed to restore orientation.*—In certain severe anxiety reaction with panic and confusion the primary therapeutic task will be to restore proper orientation and contact. These patients (termed *pseudopsychotics* by military psychiatrists during World War II) will be stuck in their disaster experience. They will call out cower and express fear and rage appropriate to that situation. Combat psychiatrists found that sedation of such patients heightened their disorientation. Consequently sedative medication of any kind for them should be avoided. Instead, special nursing should be instituted with primary emphasis devoted to restoring orientation and contact by engaging the patient in conversation.

*k. Work therapy.*—One of the most important psychologic need of these patients will be to be engaged in useful work. They should be given useful tasks around the hospital to the greatest extent practicable. They should aid in housekeeping duties around their ward. Formal occupational therapy of the arts and crafts type should be avoided. Complete recovery will be hastened by rapid discharge from the hospital so that patients may return to useful community and family roles. They are treated as normal persons expected to do a normal day's work. Most of them will improve rapidly.

1 *Manipulation of group mechanisms.*—It will be important to avoid weakening the patients' identification with family and community. Accordingly it will be important to hospitalize them as close to their homes and the scene of the disaster as is practicable. Hospitalization should be short and the emphasis should be on returning them to family and community responsibilities as rapidly as possible. There should be active information and orientation programs to promote continued identification with the war effort and the interests of the community and nation.

### SUMMARY

In the event of an atomic attack on a civil population there may be widespread panic among the people in the affected area unless there is adequate planning for the prevention and control of panic behavior. The following are among the major causes of panic: tension and insecurity; imitative behavior; suggestibility; rumor; fear of the unknown; lack of preparation and training; and stressful sensory stimuli.

Although men, as single persons or in groups, break down or disintegrate in direct ratio to the duration and intensity of stress, little is known of the factors that enable persons or groups of people to endure stress and continue productivity. Among the more important supporting factors are leadership, group identification and group solidarities, strong motivations, and the presence of incentives. The absence of community organization, education in principles of mental health, and factual orientation in the situation to be faced may add immeasurably to the impact of the stress. Contributing stresses or supports lie in family life, religious practices, educational systems, industrial practices, social customs, and group tensions.

Treatment of psychiatric casualties of a civilian disaster caused by an enemy attack should be carefully planned to reinforce constructive group and social mechanisms. Emphasis should be placed on (1) preserving the patient's identification with his community, job, and family; (2) minimizing the secondary gain of neurotic illness; and (3) avoiding suggestions of illness and disability. To this end, provision should be made for carefully controlled screening, treatment, and evacuation of psychiatric patients. Hospitalization should be afforded as close to the scene of the disaster as possible and should be short. There should be provision for treatment of effects of fatigue and exposure. Adequate sedation will be necessary for many patients. Psychotherapy for most patients will be brief. The attitudes of the psychiatrist and the absence of a hospital atmosphere in the treatment installations should promote expectation of rapid recovery.



# Modern Burn Therapy<sup>(1)</sup>

Stephen H Tolins *Commander MC, U S N* (2)

THE treatment of burns has been a controversial subject for many years. A few simple definitions and considerations are therefore in order. The simplest classification of burns is that which divides them into first, second, and third degree according to the depth of the burn. A first degree burn is a simple erythema of the skin. A second degree burn is a partial destruction of the skin with viable epithelial elements persisting. This is characterized by blebs, bullae, oozing of plasma, and areas of visible pink corium. A third degree burn is one that destroys the full thickness of the skin and sometimes the underlying tissues down to and including the bone. This is sometimes distinguishable by dry, hard, dead, white skin, firm or leathery to the touch, or by a charred appearance.

Besides the depth of the burn, important considerations are the region, the extent, and the duration of the burn. The region of the burn is of importance because of the greater susceptibility of the flexion crease areas to infection and the functional importance of such areas as the hands, elbows, and other joints. The extent of the body surface area involved directly influences the general systemic reaction which we see as the so-called burn shock, and therefore directly influences our immediate treatment of the patient as a whole. Most of the early formulas for the administration of fluids intravenously to the severely burned person were based on the percent of the body surface which was burned. Harkins (3) has stated that a severe burn greater in extent than 15 percent of the total body surface in adults and 10 percent in the very young and the very old will produce shock.

The Berkow (4) formula for the estimation of skin area assumes therefore prime importance (table 1). In very young children and in infants the head area is greater proportionally than in adults and the

(1) Received for publication 5 October 1950.

(2) Surgical Service, U. S. Naval Hospital, Portsmouth, Va., when this article was written.

(3) Harkins, H. W.: The Treatment of Burns. Charles C. Thomas, Publisher, Springfield, Ill., 1942.

(4) Berkow, S. G.: Method of estimating extent of lacerations (burns and colds) based on surface area proportions. *Arch. Surg.* 81:138-148, Jan. 1924.

thigh area less otherwise the proportions are the same in infants and in adults. Allen and Koch (5) named five main points or steps in the treatment of the burned patient:

- 1 Prevent and combat shock.
- 2 Convert the open, contaminated wound into a clean wound.
- 3 Cover the wound with a simple dressing that (a) protects it from constant danger of reinfection, (b) does not fix or destroy any part of the skin that remains viable (c) provides for drainage of the serum that exudes from the burned surface and (d) exerts a uniform, moderate pressure easily removed if infection develops.
- 4 Keep the injured part at rest.
- 5 Secure healing in minimal period of time and with minimal loss of function.

Point 1 covers the immediate general care of the patient and the maintenance of his nutritional state. The remaining 4 points deal with the local care of the burn itself.

TABLE 1 — *Berkow's formula*

Region	Percent of body surface
Head and neck	6
Upper extremities	18
Hands	4.5
Arms and forearms	13.5
Trunk — —	38
Anterior	18
Posterior	20
Lower extremities	38
Thighs	18
Legs — —	13.7
Feet — —	6.3

## GENERAL CARE

Burn shock is caused directly by a decrease in the total circulating blood volume which in turn is caused by the loss of plasma resulting in marked hemoconcentration. The plasma is lost not only by exudate from the burned surface but also by edema into the tissues surrounding the burned area. This expansion of the interstitial fluid volume takes place in the first 36 to 48 hours; dehydration of the cells and capillaries lead to renal failure. The external loss of fluid is minor compared to the pooling of lymph in the edematous area of the burn. The expansion of the interstitial fluid volume caused by the edema is proportional to the area burned. The proportion is not direct however as the expansion has usually reached its maximum of 50 percent above the normal in burns involving more than 30 percent of the body surface. The period immediately following the burn is one of great importance. Two-thirds

(5) Allen, H. S., and Koch, S. L.: Treatment of patients with severe burns, *Surg., Gynec. & Obst.* 74: 914-924, May 1942.

to three-quarters of deaths from burns occur in the first 48 hours as a result of severe and irreversible shock rather than any toxin the release of which is still purely hypothetical. Replacement therapy must be instituted promptly and according to a plan which will replace adequately the expected loss and prevent the occurrence of shock. Various formulas for the giving of plasma have been devised. Harkins (3) has recommended 100 cc. of plasma for every point of hematocrit above 45, 40 cc. of plasma for every point of hemoglobin above 100 or 100 cc. of plasma for every percent of body surface severely burned. Elkington, Wolff, and Lee (6) have pointed out that a 20 percent reduction in plasma volume can occur within 15 minutes after a burn of 20 percent of the body surface. Rhoads et al. (7) stated that a burn of moderate severity such as of a single extremity will cause a plasma loss of 1,400 cc. in 6 to 12 hours.

Cope and Moore (8) in an extensive work on fluid therapy and the redistribution of body water in burns evolved a formula based on the anticipated interstitial space expansion. They pointed out that the administration of fluid by the surface area formula does not take into account the variation in the volume of edema according to the particular body area burned, the depth of the burn, the relocation of fluid from burned to unburned areas, nor the overloading of area lymphatic trunks by multiple small burned areas. For a patient with a burn of more than 30 percent of his surface area, their formula for the first 48 hours provides replacement of fluid for the following avenues of loss: (1) for wound edema, a volume equal to 10 percent of the body weight; (2) for external loss, 1,000 cc. for a burn of 25 to 35 percent of the surface area, 2,000 cc. for a burn of 35 to 60 percent, and 3,000 cc. for a burn of over 60 percent; (3) for renal excretion, 1,500 cc. per 24 hours, half as normal saline solution and half as dextrose in water; and (4) for insensible loss, 1,500 cc. for 24 hours as dextrose in water.

The values for 1 and 2 are to be added and two-thirds of the total given as plasma or blood, the remaining third as normal saline solution. Instead of normal saline solution a combination of 2 parts normal saline solution and 1 part 1 percent sodium lactate solution has been recommended. This 48-hour ration should be divided in 4 parts: 2 parts to be given in the first 12 hours, 1 part in the second 12 hours, and the last part in the last 24 hours from the time of the burn (table 2).

The best check of the patient's condition during this critical period is the renal output. Cope and Moore (8) advise the insertion of an indwelling catheter in the seriously burned patient and a check of the hourly urine flow. This should be between 50 and 200 cc. They point

(6) Elkington, J. R.; Wolff, E. A.; and Lee, W. E.: Plasma transfusion in treatment of fluid shift in severe burns. *Ann. Surg.* 77:2: 150-157, July 1940.

(7) Rhoads, J. E.; Wiff, E. A.; Salomonsen, H.; and Lee, W. E.: Use of plasma in treatment of shock due to burns. *Clinic.* 15:37-42, June 1942.

(8) Cope, O., and Moore, F. D.: Redistribution of body water and fluid therapy of burned patients. *Ann. Surg.* 126: 1010-1043, Dec. 1947.

out that although serial hematocrit and hemoglobin determinations are of great value they do not promptly reflect the rapidly changing conditions. The hourly urine however will give a prompt indication of the adequacy of treatment. If the hourly urine output remains low the therapy may be inadequate or a renal lesion may already be present. They then advocate a water tolerance test. From 1 000 to 1 500 cc of 5 percent dextrose in water is given intravenously in from 40 to 60 minutes. If the urine output then rises previous therapy was inadequate. If there is no urinary response then a renal lesion is present and therapy must be altered to take this into account. Not more than from 1 500 to 2 000 cc should be given daily to replace insensible loss. They maintain that this so-called water tolerance test will not further embarrass an already damaged kidney nor greatly influence the amount of edema.

TABLE 2 — *Plan of fluid therapy for man weighing 70 Kg with burn of 40 percent of his surface area*

	cc
For wound edema 10 percent of body weight	7 000
For external loss in burn of 40 percent of surface area	2 000
For renal excretion for 48 hours	3 000
For insensible loss for 48 hours	3 000
Total fluid for 48 hours	15 000
Given	
Blood (and/or plasma)	6 000
Normal saline solution (or 2 parts normal saline solution with 1 part 1 percent sodium lactate solution)	4 500
5 percent dextrose in water	4 500

Administration in 4 parts for first 12 hours 2 parts for second 12 hours 1 part for second 24 hours 1 part.

Many authors in recent years have pointed out the rationale of using whole blood as replacement therapy. Moyer et al. (9) showed repeatedly that a dog with a burn of 80 percent of his surface area treated with salt solution orally and blood intravenously survived longer than a dog treated with plasma. Furthermore such a dog did not develop anemia during convalescence. Abbott et al. (10) maintained that the intravenous use of whole blood will not cause hemoconcentration if saline is given orally in sufficient quantity or together with the blood intravenously. He stated that only if the hematocrit is above 60 should plasma be given rather than whole blood. Evans and Bigger (11) stated that there may be up to a 40 percent deficit in the erythrocyte mass shortly after severe burn.

(9) Moyer, C. A.; Callier, F. A.; Job, L. V.; Vaughan, H. H.; and Marty, D. Study of interrelationship of salt solutions, cream and defibrinated blood in treatment of severely scalded, anesthetized dogs. *Ann. Surg.* 120: 367-376, Sept. 1944.

(10) Abbott, W. E.; Pilling, M. A.; Griffith, G. E.; Hirsh, J. W.; and Moyer, F. L. Metabolic alterations following thermal burns; use of whole blood and electrolyte solution in treatment of burned patients. *Ann. Surg.* 122: 678-692, Oct. 1945.

(11) Evans, E. L., and Bigger, L. A. Rational use of whole blood therapy in severe burns; clinical study. *Ann. Surg.* 122: 693-705, Oct. 1945.

Moore et al. (12) studied the erythrocyte mass and the bone marrow activity in severely burned patients by means of radioactive iron and measurements of the pigment excretion. They stated that a patient with a full thickness burn of 10 percent or more of the body surface will develop a significant anemia. Four of their patients were given at least 16,000 cc of whole blood in from 40 to 60 days but still left the hospital with an anemia after all burns were healed. They listed the following causes for this burn anemia: (1) initial hemolysis in the burn site, (2) the effect of un-neutralized plasma antibodies, (3) depression of bone marrow and (4) and in the later stages after the first 2 weeks hemorrhage from the granulating surface and blood loss caused by infection. They showed that a simple change of dressing can cause a loss of several hundred cubic centimeters of blood, and the procedure of cutting away slough and grafting may cause a loss of up to 2,000 cc.

They also pointed out that impaired gastrointestinal function and liver function may lessen iron absorption and hemoglobin synthesis. Evans and Bigger (11) also pointed out that plasma protein levels do not fall with whole blood therapy as they do with plasma therapy which they thought might result from maintaining the liver in a better state. They stated that the giving of whole blood in the presence of hemoconcentration did not produce any cases of thrombosis. Thus, although plasma therapy will prevent and combat the shock, the use of whole blood is preferable because it prevents the occurrence of anemia and hypoproteinemia. This maintenance of a good nutritional state and high red blood cell and hemoglobin levels is of great importance in the course of treatment of the burn itself especially for prompt grafting and good final results. An adequate diet rich in protein and vitamins especially vitamins C and B complex is important.

### LOCAL CARE

Harkins (3) listed about 50 methods for the local treatment of burns at the time when the then popular treatment tanning was falling into disrepute. The use of tannic acid was shown to have an influence in producing liver necrosis. Boric acid solution or ointment was shown to be toxic and in 1944 an editorial in the *Journal of the American Medical Association* came out strongly against tanning. The Surgeon General of the Army in March 1945 published a circular letter which prohibited the use of the coagulation method.

The present method of local care is simple. The burned area should be gently cleansed with plain white soap and warm water using only cotton as a brush. This should be done for about 10 minutes. Often this can be accomplished without the use of general anesthesia. This procedure must be carried out in the operating room with the surgeon and

(12) Moore, F. D., Prescott, W. C., Blakely, E. J. and Cope, O. J. *Annals of Thermal Burns*, *Ann. Surg.* 14: 811-839, Nov. 1946.



ass starts gowned, masked, and gloved as for any surgical operation. After the cleansing of the burned area a single layer of sterile fine-mesh gauze or vaseline gauze is applied. This is covered with a thick layer of mechanic waste or fluffed gauze and a layer of pads and an ace bandage is applied to give gentle even pressure. Improperly applied pressure produces ischemia. Extremities should be bandaged from the extreme distal tip proximally as far as necessary. Fingers and toes should always be separately wrapped to prevent agglutination of opposing granulating surface. The hand should be placed in a position of function and involved joints should be further put at rest by the use of splints.

The maximal redressing should not be done before at least 8 days have elapsed unless there are evidences of marked infection, such as temperature elevation, foul odor of the dressings, pain at the burned site, or marked discharge soaking the dressing. This redressing must be done in the operating room observing sterile technique. At the time of this redressing the exact extent of second and third degree burns can be ascertained. Superficial second degree burns will be almost completely healed at this time. Deeper second degree burns will be noted and can be redressed with the expectation that they will be healed in another 1 or 2 weeks. The real problem in local care is presented by the third degree or full-thickness burns. The sooner such burns are completely covered with skin the better will be the end result cosmetically and functionally.

The chief cause for delay in early grafting is the continued presence of a thick slough on the surface of the burn. If this is left to separate spontaneously many weeks will be lost. The chief problem then, is the manner by which this slough may be separated. The principal means by which this separation of the slough may be accomplished are: (1) the application of pyruvic acid paste as advocated by Connor and Harvey (13); (2) surgical excision and (3) wet dressings using Dakin's solution or some other type of solution.

Connor and Harvey stated that with the use of their pyruvic acid paste the slough can be separated and the surface ready for grafting from 10 to 14 days. The disadvantages of this method are: (1) the necessity of frequent dressing, (2) the pain produced by the paste, (3) the production of an inflammatory base of granulation, (4) the instability of the paste and (5) the large amounts of paste necessary for large surface areas. Surgical excision has many advocates. Cope et al. (14) favor immediate excision and grafting of the full-thickness burn. This is not always feasible because of the difficulty in distinguishing between the second and third degree burns. Also, where

(13) Connor, G. J. and Harvey, S. C., Pyruvic acid method in deep clinical burns. *Ann. Surg.* 141: 799-810, Nov. 1946.

(14) Cope, O., Langehr, J. L., Moore, F. D., and Webster, R. C., Jaws Expedition of full-thickness burn wound by surgical excision and grafting. *Ann. Surg.* 123: 1-22, Jan. 1947.

large burns are involved the condition of the patient is such that extensive operative procedures cannot be tolerated. This method of immediate excision and grafting is useful only in treating small circumscribed deep burns the limits of which can be definitely distinguished

Allen and Koch (5) recommend surgical excision of the slough after the first redressing at which time the limits of the third degree burns are definite and the general condition of the patient has been improved to the point where good take of the graft can be expected. The excision and grafting may be performed as a single operation or in the case of extensive burns the slough may be removed the wound redressed, and the grafting performed 2 or 3 days later. The importance of blood replacement therapy at this time must not be overlooked. Most third degree burns if not grafted early will become superficially infected in spite of antibiotic therapy which should be given to all burned patients. The wet dressing technic is most useful in treating these infected patients. Allen (15) advocated daily dressings using Dakin's solution.

The disadvantages of this technic are the pain danger of reinfection and the increased blood loss occasioned by repeatedly changing the dressing. The incorporation of catheters into the bulky pressure dressing which has as its initial layer fine-mesh gauze obviates these disadvantages. Through these catheters a solution of choice can be injected at regular intervals maintaining the moist dressing and necessitating a change of dressing only every 6 to 8 days. A solution which we have found effective in combating infection while not destroying the growing epithelium contains 0.5 percent acetic acid and 15 percent glycerin in normal saline solution. This solution may also be used immediately after the grafts have been placed.

Split-thickness grafts taken either with the dermatome or with the Blair knife should be used. Most plastic surgeons condemn the use of the pinch graft. The thinner the split graft the more likely it is to take. Areas subjected to pressure such as the sole of the foot and the palm of the hand will require reoperation at a later date for the purpose of placing a full-thickness graft but the later treatment of contraction deformities and burn scars is not part of the present discussion.

#### SUMMARY

Shock must be prevented by a judicious use of blood and electrolyte solutions according to a definite plan such as the formula of Cope and Moore. The nutritional state must be maintained by high protein and vitamin intake. The local care of the burn should be limited to gentle cleansing with white soap and water followed by application of a vaseline-gauze pressure dressing. Proper positioning of extremities

(15) All. A. H. 3:1 Symposium on minor surgery; local treatment of whole thickness burns. *Arch. Surg., Clin. North America* 28: 125-133, Feb. 1948.

with splinting of joints must be accomplished. Initial redressing should be performed on the eighth to tenth day followed by excision of the slough and skin grafting in the second week. To prepare the surface for grafting in the presence of infection, moist dressings using an acetic acid and glycerin solution injected through catheters incorporated in the dressing should be used.

# Survival After Almost Complete Body Surface Burn<sup>(1)</sup>

Relation to Newer Concepts of Treatment and Report of a Case

L. Louis Hoffman *Colonel, U S A F (MC)* (2)

A W Brown II *M. D.* (3)

**T**HIS case is being reported (1) because of the survival of a person with a 90 to 95 percent body burn (2) to advocate and support the recent physiologic trends in the use of whole blood early and in adequate amounts in spite of hemoconcentration and the feared complications of giving blood in its presence and (3) to summarize the newer more logical concept of treatment of burns

## CASE REPORT

This patient was first seen in the morning on 27 January 1950 about 30 minutes following the explosion of a butane stove. He was given first aid consisting of 15 mg of morphine and was then brought to the hospital. At the time of admission he was in severe shock. He was burned over his entire body except for (1) an area about 3 cm in diameter located beneath his chin, (2) an area on the medial surface of both legs about 2 inches in width extending from the thigh to the heel (3) the soles of the feet and (4) part of the scalp. The affected area of the body was covered with first and second degree burns except that third degree burns involved 10 percent of his back 50 percent of his hands and both of his ears. Thus third degree burns covered about 10 percent of his body. The percent of the body surface burned was computed by Berkow's method which is shown in table 1.

He was immediately given another 15 mg of morphine and was taken to the operating room where 500 cc of plasma was given. He was dressed with a pressure dressing of nitrofurazone ointment. No attempt was made to debride or clean the wound. As soon as the patient

(1) Received for publication 3 October 1950.

(2) Rees Air Force Base Lubbock, Tex.

(3) Surgical consultant, Rees Air Force Base attending surgeon Lubbock Memorial Hospital.

reached his room, a catheter was placed in his bladder in order to measure his daily and hourly urinary output.

TABLE I

	Surfa	Area	Normal percent of whole body urfa	Percent of body urfa of this patient
Head			6	4
Arms and forearms			13 3	13 3
Hands			4 3	4 3
Anterior surface of trunk			20	20
Posterior surface of trunk			18	18
Thighs			19	17
Legs			13	11
Feet			6	4
Total			100	92

At the time of diagnosis his erythrocyte count was 4,960,000 with 96 percent hemoglobin. His leukocyte count was 17,000 with 64 percent neutrophils and 36 percent lymphocytes. His hematocrit was 49. Because the morphine which he had received did not relieve his pain he was given 1,000 cc of 0.1 percent procaine in 5 percent dextrose aqueous solution. It was hoped that this might also prevent any spasm of the capillary tufts of the renal glomeruli. The results were spectacular in that the patient was immediately relieved of his pain and did not require any further sedation for the next 24 hours. He received 1,375 cc of whole blood in the first 24 hours. In addition to the above he was given 1,000 cc of 5 percent dextrose in normal saline solution intravenously. Besides other fluids he was also given one-sixth molar sodium lactate solution by mouth. His oral fluid intake was 2,360 cc. His total fluid intake for the first 24 hours was 6,235 cc. He did not vomit at any time during his stay in the hospital. His 24-hour fluid output was 1,025 cc. His temperature was 104° F on admission and dropped to 99.8° F the following morning. A booster dose of tetanus toxoid was administered immediately and 1 gram of ascorbic acid was added to the intravenous medication. He also received 300,000 units of procaine penicillin and 100,000 units of crystalline penicillin G every 12 hours and 1 ampule of intravenous vitamin B complex and vitamin C. He was given 24-hour continuous special nursing care. In the afternoon his hematocrit reading was 57 and his erythrocyte count was 5,410,000 with hemoglobin of 102 percent. The color index was 0.9.

On the morning of 28 January his erythrocyte count was 5,620,000 with 102 percent hemoglobin and his hematocrit was 56. That afternoon his erythrocyte count rose to 6,200,000; his hemoglobin was 106 percent and his hematocrit was 61. During the second 24 hours he received 500 cc of whole blood, 500 cc of plasma, Ringer's lactate solution orally and high protein, high calorie and high vitamin diet. His total fluid intake on this date was 4,450 cc. His total output of urine was 3,020. At this point it was believed that the shift of

fluids from the extracellular compartments to the intravascular system was taking place because of the high urinary output. This was substantiated the following morning by the fact that his erythrocyte count dropped from 6,200 000 to 4 790 000 his hemoglobin from 106 to 100 percent; and his hematocrit from 61 to 55. His temperature on the second day ranged from 99 to 101° F. From this day to his tenth hospital day he was given 1 cc of pyridoxine 1 ampule of vitamin B complex and 500 mg vitamin C twice a day intravenously. One vitamin B complex capsule and 200 mg ascorbic acid orally three times a day was added. The high vitamin high caloric and high protein diet was continued. The patient was also given 1 cc of desoxycorticosterone acetate intramuscularly twice a day. Blood pressures could not be taken because of the burns.

On 29 January the patient was given 500 cc of whole blood and 1 000 cc of 5 percent dextrose in distilled water. On this date his fluid intake was 5 490 cc and his fluid output was 2,320 cc. He craved salt water and drank normal saline solution instead of water. His temperature ranged between 99.2 and 103° F on this date. Demerol replaced morphine and he was given 250 mg of aureomycin 6 times a day because of temperature elevation in spite of the fact that he was receiving 600 000 units of procaine penicillin and 200 000 units of crystalline penicillin G daily. Aspirin was given to reduce the temperature when it was above 103° F.

On 30 January his erythrocyte count was 5 670 000 with 114 percent hemoglobin and a hematocrit of 56. On this date his fluid intake which consisted of water saline solution and milk reinforced by protein hydrolysate was 5 695 cc taken orally. His fluid output on this date was 3 210 cc. His temperature dropped ranging from 99.6 to 101.6° F. A multivitamin capsule 3 times a day was added to the above regimen. Demerol was no longer necessary. Phenobarbital sodium was then given for sedation with the resulting sad experience that the patient lapsed into a semicomatose stage with a stertorous type of respiration and was difficult to arouse. He remained in this condition for about 12 hours. No further sedation was needed except when his dressings were changed. His temperature range on this day was between 99.6 and 101.6° F.

On 31 January his erythrocyte count was 4 950 000 his hemoglobin was 100 percent with a hematocrit of 53. His temperature ranged from 99.8 to 100.2° F. His fluid intake on this day was 6 200 cc and his output was 2 320 cc. All of this intake was by mouth. On 1 February his erythrocyte count was 5 360 000 hemoglobin 100 percent and hematocrit 52. His fluid intake was 5 725 cc and his output was 2 325 cc. His temperature ranged between 99 and 100° F.

On 2 February his erythrocyte count was 4 940 000 with a hemoglobin of 92 percent and a hematocrit of 48. He was given 500 cc of whole blood. The catheter was removed and he began to void spontaneously.

His urinary output was 1 500 cc and his fluid intake was 4 000 cc. On this date an accurate check of his fluid intake and output was discontinued except to note that he passed over 1 500 cc of urine daily. At this time the dressings became so loose that we were unable to maintain them in position and it became necessary to change them. He was redressed with a pressure dressing of nitrofurazone ointment. Following this dressing his temperature rose to 103° F. It continued to rise on the eighth day fluctuating between 99.6 and 104.2° F.

His erythrocyte count on 3 February was 6,280 000 with hemoglobin of 98 percent and hematocrit of 54. On 4 February his red blood cell count was 5 480 000, hemoglobin 108 percent and hematocrit 49. His temperature dropped to 100° F and ranged between 100 and 101° F. On the following day his temperature was 100° F. The only abnormal elements in the urinalysis were the persistence of red blood cells and an occasional leukocyte. His general condition was excellent and he was apparently making a satisfactory recovery. His urinalyses showed a progressively decreasing number of red blood cells until 9 February at which time the urine was entirely normal and continued to be so until his discharge from the hospital. The hematocrit dropped from 46 to 42 by the twelfth day. His erythrocyte count stayed between 4 300 000 and 5 000 000 and the hemoglobin varied between 13 and 16 grams. His temperature except for a rise to 100.6° F on 8 February remained normal. This elevation of temperature occurred when he was given 0.1 gm of seconal which was followed by chills, sweating, tachycardia, stertorous breathing with 38 respirations per min. and a comatose condition with occasional cyanosis which required oxygen for relief. This lasted for 24 hours after which the patient became alert, began to eat, and to react normally. His respirations were shallow during this period. Also he complained of choking. Thirteen days after his burn, the right arm was healed. His dressings were changed 14 days after the accident because they had become loose again. Nitrofurazone ointment covered by vaseline gauze was used. The crusting lesions of the face were being cared for with saline solution and vaseline. Figures 1 and 2 show the condition of the patient's lesions on the fourteenth day. Eighteen days following the accident all the areas were healed except for his ears and his left foot. These areas required further dressings. The patient was encouraged to move all joints especially the fingers and hands from the beginning. Physiotherapy was added later and the patient recovered without limitation of motion in any joint. He began to gain weight 24 days after his injury and continued to gain thereafter until he reached his normal weight. Thirty-four days after the accident all areas were healed and the patient was returned to light work.

This patient's wife who was 6 months pregnant, sustained burns of about 40 percent of her body surface in the same accident. She was treated in the same way recovered and delivered a normal 8.7-lb baby.



*Figure 1 —Photograph taken 14 days after accident.*

Later three other patients with burns covering more than 70 percent of the body surface were similarly treated and fully recovered.

Based on a review of the literature combined with our own experience we have summarized the treatment of burns which we believe will give the best results. In the past most of the attention has been centered on the local treatment of burns but in recent years a shift of interest to the physiologic aspect of burn treatment has greatly improved prognosis.





Figure 2—Same / the / ion on the fourteenth day

## PRINCIPLES OF TREATMENT

1 *Emergency treatment* —Immediate draping of the patient in sterile or clean sheets if at all possible. Morphine should be given intravenously immediately because of its rapid and nonaccumulative action. The dose should be 10 mg intravenously. This can be repeated as often as pain dictates. Morphine given subcutaneously is often ineffective because the patient's shock results in poor peripheral circulation, hence delayed absorption of the drug. This is often repeated once or twice by the unwary resulting in cumulative action or overdosage when the shock is controlled. Morphine can be repeated at intervals intravenously when its effect wears off without danger of cumulative action. Intravenous procaine is of great value in allaying pain and discomfort when morphine is either ineffective or contraindicated. It may also be a good prophylactic measure against anuria.

2 *Admission to a hospital where adequate facilities are available*

3 *Pressure dressings* should be applied without any debridement or breaking of blebs while the patient is being prepared for transfusion. Many types of local applications are used and advocated by various authors. The method which the individual physician is accustomed to should be used. Because a patient with burns presents an ideal condition for thrombophlebitis or phlebothrombosis such as (1) shock with decreased blood flow and lower venous pressure (2) hemoconcentration with increased blood viscosity (3) prolonged immobilization (4) circular dressings (5) intravenous injections (6) sepsis (7) edema and (8) nutritional deficiencies one must be especially careful to avoid any tourniquet effect with pressure dressings of the extremities. Pressure dressings if applied too tightly about the chest and abdomen, may impede breathing and help produce atelectasis pulmonary edema and pulmonary congestion with resulting anoxemia. In hot weather massive pressure dressings may increase body temperature and discomfort.

4 *Tetanus toxoid or antitoxin* should be administered to all burned patients and prophylaxis against gas gangrene should be given if indicated.

5 *Whole blood transfusion* of 500 cc or more should be given immediately. This should be repeated daily for 3 days and thereafter as indicated by (1) the blood picture and/or (2) the shift of fluids from the extracellular spaces to the intravascular system as shown by the increased urinary output and the fall in hematocrit. Whole blood is preferred to blood substitutes because (1) it restores all deficits of circulating fluid volume better than any other single agent (2) it contains nearly twice as much protein as plasma thereby exerting a greater sparing action on body proteins (3) in controlling shock it lessens the possibilities of anoxic damage to the brain, liver, kidneys and bone marrow (4) it helps prevent toxemia (5) there is less tendency to develop pulmonary edema than when large amounts of electrolytes and

plasma are given; (6) it stimulates the function and oxygen carrying capacity of the circulating red blood cells (7) it replaces the circulating red blood cells lost through coagulation in the capillaries of the burned area increased permeability of the capillaries and red blood cell destruction by hemolysis and sepsis (8) it stimulates red blood cell regeneration; (9) it prevents vomiting caused by a delayed emptying of the stomach which is frequently associated with an inadequate or lowered total blood volume and (10) it prevents the anemias which frequently occur in the intermediate period.

Many physicians are afraid to give whole blood in hemoconcentration. The fears are exaggerated and empirical because a transfusion of blood with a hematocrit reading of 42 can only dilute a blood with a higher hematocrit reading. Early adequate treatment by whole blood transfusions will produce an earlier shift of the fluids from the extracellular compartments to the intravascular system. This is shown by increased urinary output and decrease in the hematocrit reading. The fear of giving whole blood in face of hemoconcentration is based on (1) increasing the viscosity of the circulating blood (2) increasing the chances of phlebitis thrombophlebitis or phlebothrombosis and (3) producing hemoglobinemia and hemoglobinuria with the possibility of hemoglobin crystallization in the kidney tubules. The recent literature does not show any increase in phlebitis thrombophlebitis or phlebothrombosis as the result of whole blood transfusions. According to the Coconut Grove experience no kidney damage developed as a result of hemoglobinemia and hemoglobinuria. In the recent literature we have not been able to find anything that contraindicates whole blood transfusions solely because of hemoconcentration.

**6. Electrolyte.**—As soon as the patient is admitted to his room a catheter should be inserted in the bladder in order that the urinary output may be followed. The patient should have an output in the first 24 hours of about 1,000 cc. After this he should maintain a urinary output above 1,500 cc. The electrolyte salts in the burned area consist of sodium bicarbonate and sodium chloride. If nausea and vomiting are present lactated Ringer solution should be given parenterally. In shock there is little absorption from the subcutaneous tissue, stomach, and intestinal tract until the blood flow is re-established. Therefore lactated Ringer solution should be given intravenously when shock is present. If there is no nausea or vomiting fluid should be given by mouth. Two solutions can be used by this route. One is a mixture of one teaspoonful of sodium chloride and two-thirds of a teaspoonful of sodium bicarbonate or citrate in one quart of water. The second is a one-eighth molar solution of sodium lactate. Sodium chloride alone should not be used because it might produce a acidosis. Two beneficial results are obtained from the use of sodium lactate: (1) quick control of acidosis and (2) improvement of the urinary output. There should be no arbitrary rule as to the amount of electrolyte given. This should be

determined by the patient's response to blood plasma and electrolyte administration. However 3 to 5 liters of fluid in the first 24 hours and 2 to 3 liters in the second 24 hours as tolerated seems to be reasonable. The urinary output should be the determining factor. These fluids do not prevent a metabolic acidosis (ketosis) which is likely to develop in burned or scalded children. Sugar is needed to prevent this and hard candy is a satisfactory source. No water is allowed by mouth until the shift of fluids from the extracellular compartment to the intravenous system has occurred unless there are signs of water needs. These are severe thirst, dry mucous membranes, rise in temperature and plasma sodium concentration above 138 milli-equivalents per liter. The shift of the fluids is evidenced by (1) increased urinary output, (2) fall in hematocrit and red blood cell count and (3) subsidence of edema in the burned areas. At this stage the bandages become loose. If salt solution is maintained after the shift has occurred, it will prolong the edema and interfere with healing. The huge amounts of fluids (10 000 to 15 000 cc every 24 hours) advocated in earlier periods by some physicians seems excessive and may do more harm than good. Potassium and calcium deficiencies tend to develop later because of loss through granulations especially if the patient does not eat enough at this stage. Whole or dried milk is a good source of calcium and meat, liver and fish are a good source of potassium; therefore the proteins of the diet should consist largely of milk and meat.

7 *Oxygen*.—In the treatment of shock oxygen is indicated if there is any sign of respiratory embarrassment or anoxemia.

8 *Rapid mobilization of patient*.

9 *Diet*.—It is essential to give a high protein, high caloric and high vitamin diet. The patient should have a protein intake of 200 to 400 grams a day and carbohydrates in excess of 300 grams a day. This should be supplemented by adequate amounts of vitamin B complex and ascorbic acid given intravenously and as soon as tolerated with polyvitamins and ascorbic acid given by mouth. Various investigators have proved adrenal cortical extract to be of doubtful value but we believe that it should be given so that the patient might have every advantage.

10 *Antibiotics* that are indicated should be given immediately and should be continued in sufficient amounts until the burn is healed.

11 *Skin grafting* should be performed as soon as possible.



# The Dental Aspects of Hemorrhage

Thomas W Behm, *Captain, DC, A. U. S.* (1)

THE problem of hemorrhage in dental operations can be met by pre-medication hemostasis during operation and postoperative control measures. Because one of the chief causes of excessive hemorrhage in dental operations is an increased blood pressure at the time of operation any of the barbiturates given from 20 to 30 minutes before the operation is helpful. These drugs cause a reduction in the patient's blood pressure, relieve undue anxiety and slow the heart rate. Vitamin K may also be used preoperatively, particularly if the patient has a diminished prothrombin level. It should be given several days before the operation and continued at least 2 days afterward, especially if some of the salicylates are to be used as anodynes postoperatively. If serious hemorrhage is anticipated a transfusion of 250 cc. of whole blood should be given about 1 hour preoperatively. In the case of a known hemophilic this procedure should be supplemented with an injection of the antihemophilic globulin fraction. The patient's general health should be brought to an optimal level preoperatively by the use of antibiotics, multivitamin therapy, proper diet, rest, and any of the other measures which may be indicated.

During the operation it should be remembered that (1) clean-cut wound margins present less difficulty than ragged edges, (2) a few well placed sutures can greatly aid in the control of hemorrhage from soft tissue, (3) the removal of all loose bone spicules eliminates one cause of secondary hemorrhage, (4) forcing the alveolus back into its former position after it has been sprung away will help close the bone vessels, and (5) puncture wounds made with small gage needles do not bleed as much as those made with larger needles. The control of dental hemorrhage during operation is greatly facilitated by the elevated position of the patient's head, and the use of epinephrine or some other vasoconstrictor in the local anesthetic. In spite of this excessive bleeding sometimes occurs and at such a time it must be kept in mind that all hemorrhage should be stopped with a minimum of trauma and with minimal foreign body inclusion.

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(1) Office of Surgeon, Military District of Washington, Pentagon, Washington, D. C.

Should the hemorrhage be from bone the bone should be burnished with a blunt instrument. If this is not sufficient to effect hemostasis then the procedure may be augmented by burnishing one of the bone waxes into the hemorrhaging surface. Should the hemorrhage source be the gums an attempt should be made to ligate the bleeder. Torsion or pressure from a hemostat may be sufficient to cause hemostasis. Even digital pressure over gauze may suffice particularly if the hemorrhage is from a vein or a capillary.

Cautery is occasionally useful in the control of hemorrhage especially when the affected site is deep and other means of hemostasis are difficult to effect. The heat should be kept to a minimum so that no charred tissue is left in the wound to act as a foreign body. The reaction of hemorrhage to temperature is interesting. Heat hastens coagulation, but because it produces vasodilation it may prolong the bleeding. Cold produces temporary vasoconstriction which reduces the blood flow but it usually increases the clotting time. Therefore cold is usually applied to the general area of hemorrhage and heat to the immediate area.

If all the mechanical means of hemostasis prove unsuccessful the operator can rely on such chemical agents: zinc chloride, silver nitrate, potassium permanganate, iron chloride, iron subsulfate, alum and tannic acid which act by precipitating protein, thus hastening coagulation, and by contracting the tissues at the site of hemorrhage. Such vasoconstrictors as epinephrine, ephedrine, phenylephrine, hydrochloride, cobefrine, and cotarnine phthalate may also be used in controlling the hemorrhage. Thromboplastic agents such as thrombin which accomplish hemostasis either by supplying to the blood some ingredient that is necessary for coagulation, or by rendering inert some anticoagulating substance in the blood, are important adjuncts to chemical hemostasis. The active principle of thrombin is now available as a potent sterile extract. Other thromboplastic agents such as whole blood, blood plasma, blood serum, thromboplastin, hemostatic globulin, fibrinogen, cephalin and hemoplastin are useful under certain conditions.

During the war the problem of hemostasis was further simplified by the development of such absorbent sponge material: fibrin foam (from human blood), gel foam (from animal gelatin) and oxidized cellulose. These agents which are well tolerated by the body's tissues and are absorbed completely in from 30 to 45 days serve as carriers for hemostatic agents as eliminators of dead space and as hemostatic agents themselves. These materials must be used under strictly aseptic conditions. This is particularly true of gel foam since gelatin per se is an excellent culture medium. Oxidized cellulose is highly acid and will nullify the activity of neutral thrombin so if the two are to be combined the sponge should first be soaked in a 1 percent solution of sodium bicarbonate. For this reason fibrin foam is probably the material of choice.

Although certain miscellaneous agents such as the venom of the tiger snake or of the Russell's viper, rutin and certain of the dyes such as Congo red, have been used successfully for the control of dental hemorrhage, most operators prefer the better known methods. It must be remembered that primary hemorrhage is neither an undesirable nor abnormal occurrence and that it can usually be easily controlled by some simple means such as biting pressure over sterile gauze.

The most severe abnormal primary hemorrhages occur in hemophiliacs. White and Mallett (2) have devised a satisfactory method of operating on such patients and have practiced it without fatality since 1928. They make impressions of both jaws in some soft nonirritating colloid substance and articulate the models made therefrom. The tooth to be extracted is then removed from the cast, care being taken not to touch the surrounding gingiva or the socket. An outline similar to that of a partial denture is then made including a simple single wire clasp on either side and with a saddle covering the entire socket and area adjacent to the tooth to be extracted. A splint of pink acrylic is then constructed, the operator making sure that it is not in contact with the teeth in the opposing arch. This splint should be entirely passive and should exert no pressure on the socket. The purpose of the splint is to protect the wound from the mechanical action of the tongue and food, and to hold hemostatic materials in the socket.

A small orthodontic type of elastic band is then placed around the tooth to be extracted and tucked into the gingival crevice. After several days if this has disappeared beneath the gingiva another band is placed on the tooth superimposed on the first. These bands gently detach the gingiva from the tooth and tend to loosen the tooth. Intravenous injection of 400 mg. of the antihemophilic globulin fraction or transfusion of 200 cc. of whole blood within the hour preceding the extraction provides the blood clotting factors needed in the patient's circulation. Local anesthesia of a periodontal infiltrative type is preferred because it obviates the likelihood of the trauma which may occur during the excitement stage when a general anesthetic is used.

Extraction is always slow and careful. Suturing is avoided when possible and only one tooth is removed at a time. The socket is filled immediately with thrombin powder.

Oxidized cellulose is inserted into the deepest third of the socket, and the opening at the top is gently and loosely filled. No pressure is used. Thrombin powder is placed on the splint in the area of the socket and the splint is inserted. Here as elsewhere in the operation, pressure is avoided.

A second intravenous injection of the antihemophilic globulin fraction or transfusion of whole blood is given as a precaution the follow-

(2) White, P. H., and Mallett, S. P.: Management of hemophilia in dental extractions. *J. Oral Surg.* 7: 237-246, July 1949.



ing day. Subsequent extractions may be carried out in 2 weeks. The same splint may be extended to include the new extraction site and reused. Plastic teeth may be added to the splint for cosmetic reasons and as an aid to morale.

The operative aspect of dental hemorrhage would not be complete without some mention of internal hemorrhage which may occur as petechias, ecchymoses, or hematomas. Petechias are usually an indication of hemorrhagic disease. Ecchymoses and hematomas usually occur postoperatively. Their absorption may be facilitated by the application of alternating hot and cold packs. Occasionally a hematoma may develop following the injection of the local anesthetic, especially if a vessel wall is punctured. The danger of such an occurrence can be reduced by careful, slow needle penetration by using a small gauge needle and by keeping the tip of the needle against bone during the entire injection procedure. Should a hematoma develop, the operator may apply cold compresses and strong pressure over the area involved and thus keep the swelling to a minimum and aid natural drainage, or he may make an incision and aspirate the content. The method to be used will depend on the operator, the location of the hematoma, the equipment available, and the condition of the patient. In any case, the patient should be informed of his condition, warned of the probable course of the hematoma, and instructed in home care. Only in this way can his fears and anxieties be relieved.

The postoperative treatment of dental hemorrhage starts before the patient leaves the office. At such a time the patient is usually nervous and his mind is preoccupied with thoughts of getting out of the room where the operation occurred. Therefore it is a good idea to hand him a written list of postoperative suggestions. He will still have it for reference when your oral instructions are forgotten. Such a list should include (1) biting pressure over sterile gauze for 30 minutes, (2) avoidance of the use of coffee, tea, and alcohol, (3) curtailing smoking for several hours because the nicotine acid and heat interfere with normal healing; (4) avoidance of vigorous exercise; (5) keeping the tongue out of the socket; (6) avoidance of sucking on the wound; (7) avoidance of expectoration; (8) placing an ice bag on the appropriate side of the face for 20 minutes of each hour for the first 3 or 4 hours; (9) avoidance of rinsing the mouth for 24 hours; (10) taking a relatively soft diet for 24 hours; and (11) if necessary, taking the capsules provided for pain. If the patient follows these simple rules faithfully, the incidence of postoperative hemorrhage can be appreciably reduced.

Should the patient have postoperative hemorrhage of the intermediate or secondary type, the first thing to do is to clean the mouth of any residual clot or other debris and explore the socket for loose bone fragments, pieces of tooth, or other foreign bodies. A roentgenogram may be helpful. Once the source of the hemorrhage is determined, the

procedure is much the same as that outlined for controlling primary hemorrhage. If biting pressure over sterile gauze is not sufficient digital pressure may be used. If this is not successful one of the chemical agents such as tannic acid or epinephrine may be added to the gauze. Should the hemorrhage still continue an absorbable sponge material soaked with one of the thromboplastic agents should be used. As a last resort a transfusion of whole blood may be ordered but this is rarely necessary. An important adjunct to the treatment of postoperative hemorrhage is a calm confident, reassuring manner. The patient is convinced he is bleeding to death and if your demeanor does not allay those fears he may do so.

### SUMMARY

Hemorrhage is an important consideration not only to the oral surgeon and the exodontist, but also to the periodontist, the endodontist and, in fact, to every practitioner who uses a needle or any sharp cutting instrument in the mouth. Hemorrhage is a perfectly normal physiologic reaction without which normal healing could not take place. Occasionally excessive blood loss requiring emergency measures for its control may occur. The dentist should not, however, fear hemorrhage to the point where necessary dental operations are postponed. With improved methods of anticipating excessive hemorrhage with more efficient preoperative measures with better developed surgical procedures with a host of hemostatic drugs, thromboplastics and absorbable sponge materials and with direct transfusion of whole blood as a final safeguard the dentist is now able to perform useful and necessary oral procedures even on known hemophiliacs.



# Medical Aspects of the Management of Mass Casualties<sup>(1)</sup>

H. Leonard Jones, Jr. *Commander MC, U.S.N.*

A "SHOCK and Burn Program" was organized aboard the *U.S.S. Repose* prior to my assignment to that hospital ship in July 1947. It provided for a team of 3 medical officers (chief of medicine, medical officer in charge of medical and isolation wards, and a neuropsychiatrist), 2 nurses, and 10 hospital corpsmen trained especially for the treatment of shock and burns in the admission ward. Most of the details had been well worked out and specifically set forth in a memorandum from the senior medical officer. The principles of treatment were based to a large extent on experience gained in World War II (2-6).

## MANAGEMENT OF CHINESE CASUALTIES FOLLOWING AN EXPLOSION

In March 1948, while the ship was docked at Tsingtao, China, we had an opportunity to see how this program would work in actual practice for it was then that an explosion occurred in a Chinese ammunition dump about a mile from the ship. There were an estimated 200 casualties, all of whom were Chinese. Of these, 54 of the most serious were immediately

(1) Presented 29 November 1950 at a monthly medical meeting, U. S. Naval Air Station, San Diego, Calif.

(2) National Research Council, Committee on Surgery: Burns, Shock, Wound Healing and Vascular Injuries. Prepared under the auspices of the Committee of the Division of Medical Sciences of Council. (Military surgical manual, No. 5) W. B. Saunders Co., Philadelphia, Pa., 1943.

(3) Reed, F. P., and Sweetser, H. B., Jr. Symposium on military medicine aboard U.S.S. *Summit*, medical problems of internment on hospital ship *U.S. Nav. M. Bull.* 46: 43-48, Jan. 1946.

(4) Drake, E. H., Sprague, F. W., Sprague, H. B., and McGinty, A. P., Wartime log of the United States naval hospital ship *Solace* from Jan. 1943. *U. S. N. M. Bull.* 48: 750-768, Sept.-Oct. 1948.

(5) Tennill, M. Nursing on hospital ship. *Mil. Surgeon* 200: 418-421, May 1947.

(6) Roddus, L. H. A. Wellcome prize essay: burns incident to war. *Measures for their prevention and for treatment.* *Mil. Surgeon* 94: 65-75, Feb. 1944.

brought by our ambulances to the ship. Practically all of them were in varying degrees of shock or incipient shock. Most of them therefore were first admitted to the shock and burn ward which had 44 bunk. The majority of these casualties had multiple wounds and many had fractures but only one was badly burned. Ten patients had cranio-cerebral injuries and 5 had fractured spines; all these required frequent neurologic evaluation. The complications observed were 1 case of chylous thorax (from fractured ribs), pneumonia, atelectasis, and pulmonary edema (cerebral). One blast injury of the abdomen was seen. One patient had no injuries but had developed a conversion hysterical in the form of stocking anesthesia of both feet and legs. All patients except 4 who died, were transferred to local Chinese hospitals within a few days for further treatment.

## EXPANSION OF FUNCTIONS OF THE SHOCK AND BURN TEAM

In reviewing our experiences with these patients it was believed that the functions of the shock and burn team should be broadened to include most if not all, possible medical aspects of casualties encountered either in peacetime or in wartime. The primary reason for this was to relieve the surgeons of everything possible except surgical operations. In this decision we were mindful of the excellent suggestion of McCombs (7), who described a plan used in a special treatment ward for critically injured patients in a naval base hospital and who summarized its advantages in these words: "the saving of valuable time in emergency; the more effective utilization of professional skills; the conservation of manpower among trained personnel; the improvement of patient morale; the proper coordination of diverse therapeutic methods; and the early recognition and treatment of complications."

Accordingly we expanded the special training of personnel and the supplies and equipment concentrated in this ward to anticipate the medical management not only of shock and burns, but also of asphyxia from suffocation, submersion and smoke inhalation blast concussion chest injuries and their medical complications, as well as cranio-cerebral and spinal injuries. Moreover the decontamination center for gas and atomic radiation casualties was located adjacent to this ward. Furthermore the prevention and treatment of all medically controllable infections incident to trauma was the especial duty of this team, as well as the administration of analgesics sedatives, stimulants and the medical control of increased intracranial pressure restoration and maintenance of fluid, nutritional and electrolyte balance pre- and post-operatively even after the patient was sent to a surgical ward.

Because the patient work involved in keeping an adequate record of the rapidly changing condition of many patients was one of the most time-consuming operations a special chart was devised to minimize it. This chart was a modification of that found to be useful by an Army shock

(7) McCombs, R. P. Special treatment ward for critically injured. U. S. Nav. M. Bull. 49:717-724, Oct. 1945.

team (8). The first sheet of the chart (fig. 1) is largely self explanatory. With mass casualties especially those in coma or those who are unable to speak English it is helpful to assign consecutive numbers to patients.

Name	Date:	No. (X-ray No. Serial)
Rate:	Service No.	(USN) (USMC) (USA) (CIV)
Time of Injury:	Time of Admission:	Blood Group:
Diagnosis:		
Cause of Injury:		

Description of Wound (Use Attached Anatomical Chart)

Neurological Data (Use Attached Anatomical Chart)

Extent of Burn: (Use Attached Anatomical Chart)

X-ray Data

Surgical Data

Time and Date of Transfer to Ward.	:
(Critical List) (Serious List) Time:	Date
(Deceased) Time:	Date:
Name of kin	
Address:	

NOTE.—Anatomical Charts have been attached to this chart for the purpose of indicating extent of burn, wound, fractures, and neurological signs. The chart will be used as far as is practicable.

Figure 1.—First sheet (reduced from larger size).

who can have corresponding numbers on their roentgenograms. The second sheet (fig. 2) to be attached to the first sheet requires a minimal amount of writing for a complete 24-hour record of the patient's changing

	Time
	Blood pressure
	Pulse
	R. respiration
	Temperature
	Pallor
	Perspiration
	Restlessness
	Dyspnea
	Swelling
	Hemoptysis
	Hematuria
	Specific gravity (blood)
	Specific gravity (plasma)
	Other laboratory results
	Urinary output
	Whole blood
	Plasma
	Dextrose 5% in saline solution
	Dextrose 5% in distilled water
	Normal saline solution
	Liquor (orally)
	Morphine
	Amberbital sodium
	Tetracycline
	Gas gangrene antitoxin
	Penicillin
	Cocaine or stimulant
	Dose or remarks

Figure 2.—Second sheet.  
(Reduced from larger size to fit on this page—Editor.)

NVS-Form 59a  
Rev. 1-49

## ANATOMICAL CHART FOR CLINICAL RECORD

Name

Rank or rate

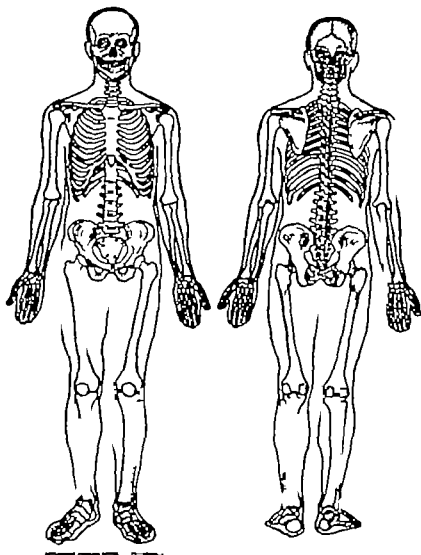


Figure 3.

vital signs, the treatment ordered and treatment given. The medical officer simply indicates at the top of the second sheet how frequently the vital signs are to be taken, and the amount of a given fluid or other medication to be given; and the nurse or hospital corpsman writes in the time this is actually done and makes other appropriate entries. Fluid intake and output can also be easily calculated at any given time and changes in laboratory data can be readily correlated with clinical changes. It was also believed that much time could be saved by using one or more of the Navy's Anatomical Charts for Clinical Record (NVS-Form 59a) (fig. 3) for each patient by indicating the essential data for



the location and extent of wounds, fractures and burns, and neurologic signs e. g. reflex and sensory changes et cetera without the necessity of describing anatomic locations.

### MANAGEMENT OF CASUALTIES FROM BRITISH SHIPS SHELLED BY CHINESE COMMUNISTS

About 1 year after the explosion in Tsingtao, we had an opportunity to put our augmented plan into practice. On 21 April 1949, this ship received emergency orders to proceed to the junction of the Yangtze and Yangtze rivers, near Shanghai, to assist in the care of British casualties incurred in the shelling of 4 British warships by Chinese Communists. These casualties, 78 in number, were in serious or critical condition, but they were received in stages over a period of 3 days and in some instances had received and responded to shock treatment. Even so, we found that the new plan—and especially the time-saving clinical and anatomic charts admirably met a need which we so keenly felt in the explosion at Tsingtao the previous year.

Even though shock was not as common in these patients, number required close attention to maintain fluid, electrolyte and caloric balances and frequent neurologic evaluation. For example, there were 3 comatose patients with craniocerebral injuries, 3 patients with partial or complete transections of the spinal cord, and 2 with peripheral nerve injuries. Three patients with penetrating chest wounds complicated by hemothorax presented particularly difficult problems. Only 3 were burned. Nine patients had compound fractures. Most of the patients had multiple soft tissue fragmentation wounds, many complicated by infection. There were 2 deaths in the 8 to 10 days of treatment before the patients were transferred to the British Naval Hospital in Hong Kong.

### DISCUSSION

Of great importance in the handling of mass casualties is the prompt selection of critical and serious cases for the most rapid and efficient treatment. This is achieved by integrated activity among the various departments of the hospital unit through proper planning in advance. The component parts of a smoothly running therapeutic machine include: (1) proper selection through training and frequent drill of the team personnel in specifically assigned primary and alternate tasks; (2) centralization of essential supplies and equipment in admission and overflow wards but adequate dispersal elsewhere especially in wartime; and (3) the use of individual compact charts in order to reduce to a minimum the time required in recording essential clinical data, treatment prescribed and treatment given, and to have this information available for rapid inspection. Planning and teamwork epitomize these factors which lead logically to efficiency and a high esprit de corps during the inevitably fatiguing management of large numbers of casualties in a critical condition.

It was a relatively simple matter to train selected hospital corpsmen and nurses for their assigned duties which could be interchanged, for a most part as the occasion demanded. Removing patients' clothes, taking and recording vital signs, notations of changing symptoms and signs and reporting adverse changes to the medical officer were generally done by 3 or more hospital corpsmen. Laboratory work was performed by laboratory technicians not assigned to the team but the results were recorded by a designated corpsman on the team. Three or more hospital corpsmen generally gave the intravenous and oral fluids and other medications. The 2 nurses were usually busy with special nursing dressings, oxygen administration, preparing for special treatments to be given by the medical officers and informing them of sudden adverse changes in the condition of patients. The 3 medical officers were occupied with local and general physical or neurologic examinations, reviewing the shock charts, writing orders, giving special treatments and conferring with the surgeons on the priority of urgent operations. The latter was done in the operating room, on joint ward rounds or in the x-ray viewing room.

Inasmuch as the 3 medical officers assigned to the shock team had little training, experience and interest in major surgery, it was reasonable to assume that their services would best be used in the various duties required exclusive of such operative procedures. At first sight, such duties in handling traumatic casualties would appear to be chiefly in the domain of the surgeon, but many of these should in fact be of just as much interest to those primarily trained in general medicine, neurology and psychiatry. Certainly this is true of the management of all phases of shock, fluid and electrolyte imbalances, most early burns, blast concussion, submersion, smoke narcosis, nonsurgical injuries of the nervous system, medical complications of thoracic injuries, infections and malnutrition incident to trauma (but preventable or controllable by purely medical measures), thromboembolic phenomena, and psychosomatic disorders caused or precipitated by trauma or threat of trauma. Much of the preoperative and postoperative care of patients sustaining injuries of any sort entails one or more of the above medical aspects.

Probably even more important would be the medical aspects in the management of mass casualties in atomic warfare. It has been estimated that between 20 and 30 percent of the fatalities at Nagasaki and Hiroshima were the result of flash burns (9). This does not include secondary burns from flaming wreckage. About 15 percent of the deaths at Hiroshima could have been caused by ionizing radiation effects, but most of these could just as well have been caused entirely by the con-

(9) Bureau of Medicine and Surgery, Navy Department: An Introduction to Radiological Safety: Medical Aspects of an Atomic Explosion, Thermal Blast. Government Printing Office, Washington, D. C., 1947, p. 41.

corrikant blast trauma and burns (10). The low reported incidence of fractures and flame burn among these casualties has been ascribed to the failure of rescue operations. Though I have been unable to find estimates in the incidences of nonfatal cases of acute total body radiation illness and of flash burns with or without associated blast injuries I surmise from the nature of an atomic explosion that they would constitute a very high percentage in combination at least. The treatment of radiation illness with its varying degrees of failure of erythropoiesis, granulocytic infections, bacterial invasion, hemorrhage, vomiting and diarrhea from ulcerative gastroenteritis as well as the phylactoid phenomena is primarily medical and not surgical (11).

The modern treatment of flash and flame burns in many instances in the earlier stages at least predominantly medical and often entails similar problems in fluid and electrolyte replacement and antibiotic therapy. The recent announcement (12) of the availability of ACTH and cortisone is a factor for field trial in the treatment of burn is encouraging. This is another illustration of the growing recognition of the importance of treating the patient as a whole in his reactions to injury and stress (13).

### SUMMARY

It is hoped that our experience will point up the need for extensive preparations for the management of far larger number of casualties in the event of disaster of any type at shore establishments and for the management of the patient as a whole and the creation of functional teams in the practice of this concept (14). Certainly planning and intensive training of personnel in specific primary and immediate duties will be advantageous in the event of mass casualties. A segment of medical life is not only to surgical teams but also to medical teams according to their aptitudes, training and experience as an important part of these preparations. The improved methods for early detection of peripheral circulatory failure of hypoxia of any type of fluid, electrolyte, nutritional and endocrine imbalance and the recognition of their potentially grave effect on the kidney, brain, liver and heart should be of equal concern to entire teams, regardless of the original cause. Their correction by refined techniques should be capably handled by a well-trained medical team while the surgical team is busy

(10) Ames, M. J. Atomic bomb or survival. *Mil Surgeon* 106: 270-273, Apr. 1950.

(11) Crook, F. P., and Chapman, R. H. Critical analysis of syndrome of acute total body radiation illness, role in atomic war and influence on future practice of military medicine. *Mil Surgeon* 104: 7-21, Jan. 1949.

(12) A declaration of intent: Cortisone and ACTH for Army Service. *Mil Surgeon* 107: 411, No. 1950.

(13) Selye, H. General adaptation syndrome and disease of adaptation. *J. Clin. Endocrinol.* 6: 117-230, Feb. 1946.

(14) Casberg, M. A. Curriculum in medical education. *U. S. Armed Forces M. J.* 1: 1065-1076, Sept. 1950.

operating (15-21) Such division of responsibility and labor will surely be indicated in the management of the even more complicated casualties expected in the event of atomic warfare

(15) Maddock, W. G.: Some fundamental in water and electrolyte balance. *Ohio State M. J.* 45: 462-475, May 1949

(16) Wagenstein, O. H.: Care of patient before and after operation, with special reference to fluid requirements and importance of weighing scale in evaluating status of hydration. *New England J. Med.* 236: 121-129 Jan. 23, 1947

(17) Rowdin, L. S.: Recent advances affecting care of military casualties. *Mil. Surgeon* 106: 177-181 Mar. 1950.

(18) Merrill, J. P., Levin, H. D., Somerville, W. and Smith, S., III: Clinical recognition and treatment of acute potassium intoxication. *Ann. Int. Med.* 33: 797-830 Oct. 1950.

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(20) Bant, A. M., and Talbot, N. B.: Medical progress; parenteral-fluid therapy: indication and provision of daily maintenance requirements. *New England J. Med.* 231: 585-590 Oct. 26, 1944.

(21) Harrison, T. R.: *Principles of Internal Medicine*. The Blakiston Co. Philadelphia, Pa., 1950.



# Use of Excretory Urograms as a Screening Procedure

Thomas H. Williams J    *Captain, U S A, F R. (MC) (1)*

**E**XCRETORY urography is of special diagnostic use if one is fully aware of its limitations. This procedure has particular use in the smaller military medical establishments where x-ray facilities are available but a full-time urologist is not. For the past year we have used this idea in operating the urology clinic at this hospital. The clinic was scheduled to operate for 4 hours one morning every week and was conducted by a civilian urologist for the Air Force installations in this area. This amount of time was insufficient for evaluating a large number of new diagnostic problems and it soon became obvious that some sort of screening routine would have to be established. It was decided to have intravenous urograms and urinalyses on patients with complaints referable to the urinary tract but those with complaints referable to the genitals were not given a preliminary work-up because a large number of such patients could be seen in a relatively short time. By means of the urograms it was usually easy to determine whether or not further procedures were necessary and whether hospitalization were indicated.

The patients included military personnel dependents and civilian employees of Maxwell Air Force Base. Their ages ranged from a few months to 70 years. The diagnoses included carcinoma of the bladder, nephroptosis, chronic pyelonephritis, urinary tract calculi, hydronephrosis, renal ectopia, stricture of the ureter, pregnancy and vesicorectal fistula.

The technic of urography consisted of restriction of food and fluids for 12 hours prior to roentgenography, a laxative the evening prior to roentgenography and an intravenous injection of diodrast. This satisfactorily prepared the majority of these outpatients. For small children diodrast and hyaluronidase were given subcutaneously. Roentgenograms were taken at 5 minute intervals for 15 minutes and after 30 minutes a roentgenogram was taken with the patient in the upright and the supine position. The latter was centered over the bladder and was especially

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(1) Urologic consultant of the State Hospital, Maxwell Air Force Base, Ala.

valuable in obtaining an excretory cystogram. The films were interpreted by both the radiologist and the urologist. Frequently films rated as unsatisfactory by the radiologist were considered adequate by the urologist. The radiologist reported what he saw in the films whereas the urologist used the urograms to give him clues and not necessarily diagnoses. With the clinical history in mind this was quite satisfactory. It was demonstrated again and again that a negative urine and negative physical examination did not exclude urinary tract diseases that could be diagnosed with excretory urograms. It was also evident that excretory urograms leave much to be desired in difficult diagnostic problems and are not a substitute for cystoscopy and retrograde pyelography. If this is borne in mind one is usually not lulled into a false sense of security by the use of this procedure.

During the 12-month period 432 outpatients were examined in the urology clinic. Of this group 102 had signs or symptoms indicating need for an excretory urogram. This procedure was usually carried out by the medical officers prior to referring the patients to the urologist. Of the 102 patients x-rayed 49 had positive findings (table 1). Although these findings often made further procedure necessary negative findings did not exclude need of further procedures.

TABLE 1—Excretory urogram findings in 49 patients

Diagnosis	Number of patients
Nephroptosis	11
Neoplasm of ureter	1
Hydronephrosis	10
Ureterectal calculi	1
Renal calculi	11
Ureteral calculi	8
Bladder calculi	3
Capillary ectopia	1
Polycystic disease	1
Carcinoma of prostate	1
Pregnancy	1
Total	49

Many of these patients had complaints that ordinarily would lead to physical examination, urinalysis and then a prescription for either treatment of infection or control of pain. Too often this routine occurs when one physician has to see a large number of people in a supposedly healthy group. If one follows the procedure we have used with this group of 432 patients it will not be long before it becomes obvious that many serious urologic diseases produce relatively few signs or symptoms. The following case histories illustrate this point.

### CASE REPORTS

*Case 1*—A 30-year-old sergeant reported to the clinic complaining of bloody urine of 2 days' duration and pain in the right flank of 2 hours' duration. Two years previously he had noted a dull pain in the left lum-

bar area and had reported on sick call off and on for this complaint. His urine was grossly bloody and there was definite tenderness over the right kidney. The urograms revealed a large staghorn calculus in the left kidney, a small calculus in the right kidney and another small calculus in the right ureter at the level of the fourth lumbar vertebra.

*Case 2.*—A 26-year-old airman came to the clinic complaining that he had prostatitis. For the previous 6 months he had noted occasional burning on urination and frequency of urination. He had dull pain in the penneum from time to time. He had had occasional massages for "prostatitis." Examination was negative. Excretory urograms revealed normal kidneys and ureters but a suggestion of a filling defect on the right side of the bladder. Cystoscopic examination and biopsy at a later date revealed that this patient had transitional cell carcinoma of the bladder.

*Case 3.*—A 19-year-old married woman came to the clinic complaining of vague dull aching pain in the right flank. She had had this for 5 years but following a recent pregnancy noted marked increase in the severity of her pain. This pain did not radiate and was not colicky. She had no other urinary signs or symptoms. Her urine showed occasional pus cells. Urograms revealed that she had a hydronephrosis and nephroptosis of the right kidney.

### CONCLUSIONS

Excretory urograms are a valuable diagnostic aid in screening patients for possible urologic disease especially in smaller military medical establishments. Excretory urograms are not a substitute for cystoscopy and retrograde pyelograms but can often obviate the need for this procedure thus avoiding discomfort to patient, loss of man-hours to the Armed Forces and more efficient use of military hospital facilities and personnel. No matter how minor the urologic complaint, careful investigation is necessary.





# Prevention of Rheumatic Fever<sup>(1)</sup>

A REPORT of a study of the prevention of rheumatic fever by treating the preceding streptococcal infection is submitted at this time because the results obtained thus far appear to be sufficiently definite and favorable to warrant specific recommendations.

## DESCRIPTION OF THE STUDY

The study was conducted between 24 January 1949 and 22 February 1950. This air base houses a technical training school where about 60 percent of the men are trainees who report after 12 weeks of basic training at a southwestern base. All patients admitted to the hospital for respiratory disease were seen within a few hours by one of the members of the professional staff of the laboratory. Those having exudate on the tonsils or on the pharyngeal wall were included in the study group. A total of 2,340 such patients were observed. A total of 1,178 patients whose Air Force serial number ended in an even digit received penicillin treatment; 1,162 with an odd digit comprised the control group and received no specific treatment. Procaine penicillin G (suspended in peanut oil containing 2 percent aluminum monostearate) was given intramuscularly as soon after admission as possible according to the treatment schedules outlined in table 1.

Follow-up studies for the detection of rheumatic fever were performed between the third and fourth weeks after the initial infection and without knowledge of the serial numbers of the patients or of their previous treatment. Those patients suspected of having acute rheumatic fever were hospitalized until a satisfactory diagnosis was established. Routine electrocardiograms and sedimentation rates were obtained through the cooperation of the hospital laboratory. Rigid criteria for diagnosis were followed using a modification of the classification of

(1) From the Streptococcal Diseases Laboratory, Francis E. Warren Air Force Base, Wyoming, the Commission on Acute Respiratory Diseases (John H. Dingler, director), Armed Forces Epidemiological Board, and the Department of Preventive Medicine, School of Medicine, Western Reserve University, Cleveland, Ohio. The professional staff of the laboratory during the period of this study consisted of: Charles H. Ramsdell, M.D., Field Director; Floyd W. Denney, Major, MC, A. U. S., Assistant Director; William R. Blank, Capt., MC, A. U. S.; Harold B. Houser, Capt., MC, A. U. S.; Edward O. Haka, Capt., MC, A. U. S.; and Lewis W. Wonnemaker, Capt., MC, A. U. S.

Jones. Major criteria included carditis, migrating polyarthritides, history of recurrences, chorea, and subcutaneous nodules; minor manifestations included fever, arthralgia, skin rash, nonspecific electrocardiographic changes, and elevated sedimentation rate. For a diagnosis of definite acute rheumatic fever a patient had to present two major or one major and two minor manifestations. For a diagnosis of probable acute rheumatic fever a patient had to present one major and one minor, one major or two minor manifestations. Instances of abdominal pain, epistaxis, pulmonary changes, and anemia were encountered but did not contribute to the classification of these patients. No patient with chorea or subcutaneous nodules was encountered. Only those developing acute rheumatic fever within 45 days of onset of the observed streptococcal infection are included in this report.

TABLE 1.—Distribution of patients with exudative pharyngitis and tonsillitis according to treatment.

Penicillin (1) dosage schedule	Inclusive dates	Number		Total
		Treated	Untreated	
I. 500,000 U stat. 500,000 U 48 hr 600,000 U 96 hr	3 Mar. 15 Sept. 1949	634	582	1,216
II. 500,000 U stat. 500,000 U 72 hr	24 Jan. 2 Mar. 1949	254	288	542
III. 600,000 U stat.	16 Sept. 1949-22 Feb. 1950	290	292	582
Total		1,178	1,162	2,340

(1) Procaine penicillin G is given at a dose of 2 percent solution intramuscularly.

Throat cultures and blood specimens were obtained from the patients on admission and again at the time of the follow-up examination. Strains of beta hemolytic streptococcus isolated from cultures were grouped and typed according to the method of Lancefield. Antistreptolysin O titers were performed on sera from acutely ill and convalescent patients according to a modification of the method of Hodge and Swift.

## RESULTS

Of the 1,178 patients who were treated with penicillin, only 2 developed definite acute rheumatic fever. In contrast, 28 of the 1,162 untreated patients developed the disease (table 2), a difference which is unlikely to be caused by chance. The diagnosis of possible acute rheumatic fever was made in 3 patients in the treated group and in 7 patients in the untreated group. Of the 2 patients in the treated group who became ill with rheumatic fever, one was treated within 9 hours after the onset of the symptoms of the streptococcal disease and the other about 4 days after onset.

TABLE 2.—*Poststreptococcal sequelae developing within 45 days after an attack of exudative tonsillitis or pharyngitis*

Treatment schedule	Classification	Number of patients	
		Treated	Untreated
I	Number of patients .....	634	582
	Definite rheumatic fever .....	2	20
	Possible rheumatic fever .....	1	2
II	Number of patients .....	254	268
	Definite rheumatic fever .....	0	4
	Possible rheumatic fever .....	1	4
III	Number of patients .....	290	292
	Definite rheumatic fever .....	0	4
	Possible rheumatic fever .....	1	1
Total	Number of patients .....	1 178	1 162
	Definite rheumatic fever .....	2	28
	Possible rheumatic fever .....	3	7

The effect of penicillin treatment on the presence of beta-hemolytic streptococci in cultures of the throat is shown in table 3. In spite of the variation in the carrier rates during the course of the study it is apparent from the data that penicillin therapy effected a reduction of Group A streptococci when compared to the control groups. Furthermore, there was a definite relationship between the effectiveness of such treatment and the dosage schedule of penicillin. The carrier rates were decreased 75, 60, and 46 percent by the penicillin dosage Schedules I, II, and III respectively.

TABLE 3.—*Effect of 3 different schedules of penicillin on Group A streptococci*

	Time of culture	
	Group A on dates on	Group A on follow-up examination
<i>Penicillin schedule I</i>		
Treated:		
Number cultured .....	626	508
Percent positive .....	78.4	12.8
Untreated:		
Number cultured .....	571	482
Percent positive .....	85.6	51.9
<i>Penicillin schedule II</i>		
Treated:		
Number cultured .....	251	200
Percent positive .....	66.5	17.5
Untreated:		
Number cultured .....	287	234
Percent positive .....	66.9	44.0
<i>Penicillin schedule III</i>		
Treated:		
Number cultured .....	290	257
Percent positive .....	70.7	30.7
Untreated:		
Number cultured .....	292	269
Percent positive .....	71.6	56.5

Because the number of true streptococcal infections varied somewhat during the study the degree of inhibition of antibody by penicillin is best expressed as the percent reduction in the antibody increase in the treated as compared to the untreated patients. The degree of antibody inhibition produced by penicillin therapy in Schedule I was 51 percent in Schedule II 38 percent and in Schedule III, 26 percent. It is thus apparent from these figures that insofar as the suppression of antibody is concerned the use of three injections totaling 1 200 000 units of depot penicillin was twice as effective as a single injection of 600 000 units.

The prevention of rheumatic fever, the inhibition of antibody and the partial eradication of streptococcus in the group of patients treated with penicillin assume more significance when the compositions of the treated group and of the control group are compared. That the two groups were comparable is demonstrated in table 4. Moreover, a large proportion of the illnesses in both groups was streptococcal in origin;

TABLE 4—*Comparability of the treated and untreated group*

	Treatment schedule					
	I		II		III	
	Treated (percent)	Untreated (percent)	Treated (percent)	Untreated (percent)	Treated (percent)	Untreated (percent)
Age 17-20 years	82.9	80.9	87.2	90.2	72.8	72.9
Previous history of						
Rheumatic fever	2.2	2.6	2.4	2.8	1.4	1.7
Heart murmur	1.7	1.4	2.0	2.4	4.3	5.8
Tonsillectomy	25.7	30.6	28.0	27.8	23.8	22.9
Cauldwell's test	7.7	6.0	7.1	4.3	9.3	8.6
Leukocyte count of 12,000 or over on two consecutive group A streptococci throat cultures on admission	65.2	71.5	60.9	58.9	60.8	56.6
Type distribution of group A streptococci	72.4	85.6	66.5	66.9	70.7	71.6
Type 3	26.5	29.4	24.0	20.8	12.2	15.3
Type 14	40.6	33.1	15.6	19.8	53.2	48.5
Type 24	16.7	19.8	49.1	43.8	8.8	7.2
Antibody titer of 1:5 or less on admission	68.4	70.1	76.5	67.4	66.0	70.7
Titer less than 24 hours after onset of respiratory symptoms	27.8		26.0		24.0	
Follow-up obtained	81.4	8.7	78.7	83.0	90.3	92.5

Group A beta-hemolytic streptococci were isolated from 76 percent of all admissions on cultures and 68 percent of the untreated patients showed a two-tube or greater antistreptolysin response.

## DISCUSSION

The data presented concerning the incidence of rheumatic fever in the treated and control groups establish the fact that penicillin therapy for acute streptococcal infections will almost completely prevent the

subsequent occurrence of rheumatic fever. These results emphasize again the close relationship between streptococcal disease and rheumatic fever.

Sulfonamides have proved to be ineffective in the prevention of rheumatic fever when used in treating the acute streptococcal illness. Previous experience with penicillin has been conflicting. Weinstein et al. (2) treated 225 patients with scarlet fever with penicillin. 7 of these subsequently developed rheumatic fever. This observation supports Finland's (3) conclusion from a review of the literature that penicillin is not effective when used in this manner for the prevention of rheumatic fever. On the contrary, Massell et al. (4) employed penicillin to treat 10 clinical and 5 subclinical hemolytic streptococcal infections in patients hospitalized for rheumatic fever or rheumatic heart disease; these patients failed to exhibit subsequent recurrences. Jersild (5) has shown that poststreptococcal complications including nephritis are reduced after penicillin treatment of the initial illness but makes no statement of the occurrence of rheumatic fever.

Exudate on the tonsils or oropharynx was used as the sole means of selection of patients to be included in this study because it was a rapid, easily standardized method. It was thought that such a criterion would include the majority of streptococcal respiratory infections because various studies have shown that exudative lesions of the throat appear in from 60 to 90 percent of streptococcal infections, particularly in a population experiencing epidemic rates of streptococcal illnesses. The isolation of Group A streptococci from 76 percent of the patients and the demonstration of an increase in the antistreptolysin O titer in 68 percent of the control group indicate that the majority of the patients actually had streptococcal disease. A few undoubtedly had nonstreptococcal exudative tonsillitis.

If the incidence of rheumatic fever is to be reduced materially by early treatment with penicillin, it becomes necessary that streptococcal infections be diagnosed accurately and early. In some patients the clinical findings alone will permit an almost certain diagnosis of a streptococcal infection. Characteristically such illnesses present a sudden onset of sore throat with pain on swallowing; fever and other constitutional reactions; diffuse redness and edema of the soft palate, tonsils and oropharynx; discrete or confluent exudate; and large or tender cervical lymph nodes. Supportive data may be obtained from the laboratory. Many patients will have an elevated leukocyte count. Cultures of the pharynx will almost always show a predominant growth of

(2) Weinstein, L., Bauman, L., and Perrin, T. S. Studies of influence of penicillin on course of acute streptococcal pharyngitis. *J. Clin. Investigation* 28: 817-819, 1949.

(3) Finland, M. U. Penicillin in infections other than bacterial endocarditis. *Advance. Int. Med.* 2: 350-438, 1947.

(4) Massell, R. F.; Dow, J. W., and Jones, T. D. Oral penicillin in patients with rheumatic fever. *J. A. M. A.* 138: 1030-1036, Dec. 4, 1948.

(5) Jersild, T. Penicillin therapy of scarlet fever and complications of it. *Lancet* 254: 677-678, May 1, 1948.

beta hemolytic streptococci. Depending on the availability and use of the above criteria a large percent of streptococcal respiratory infections can be reliably and rapidly diagnosed particularly during an epidemic period. Treatment with penicillin can thus be instituted immediately.

### SUMMARY

Evidence is presented to indicate that rheumatic fever can be prevented by the treatment of streptococcal disease with penicillin. A total of 1 178 patients with streptococcal infections were treated with penicillin, only 2 subsequently developed acute rheumatic fever. Of 1 162 untreated patients 28 developed the disease. Penicillin therapy likewise suppresses the antistreptolysin "O" response and eradicates the streptococci in many cases.

### RECOMMENDATIONS

All patients with streptococcal infections should receive penicillin.

#### 1. Selection of patients for treatment with penicillin

All patients reporting to the dispensary or to the hospital presenting classical features of streptococcal respiratory disease should receive penicillin therapy. Streptococcal infections develop rapidly and are usually associated with sore throat (pain on swallowing), fever, diffuse redness and edema of the soft palate, tonsils and oropharynx, discrete or confluent exudate and large and tender cervical lymph nodes. Classically such patients develop a leukocytosis and show streptococci on culture.

b. In areas where streptococcal infections are epidemic all patients with exudative tonsillitis or pharyngitis should be considered streptococcal in origin and receive treatment.

c. In military installations where nonstreptococcal exudative tonsillitis or pharyngitis is common a leukocyte count should be obtained from each patient exhibiting exudative lesions. When this count is 10 000 or greater treatment should be instituted.

d. All personnel admitted to the hospital with respiratory infections not characterized by exudative tonsillitis or pharyngitis should have a leukocyte count. If this count is 10 000 or greater the disease should be considered streptococcal in origin. Exclusion of other diagnostic categories by clinical or laboratory data should be made.

e. In those hospitals where adequate bacteriologic facilities are available a throat culture should be obtained from each patient admitted to the hospital with respiratory disease. Those patients whose cultures show 10 or more colonies of beta-hemolytic streptococci on sheep blood agar plates should receive penicillin therapy.

## 2 Methods of treatment

a For patients who do not give a past history of rheumatic fever or who have no evidence of rheumatic heart disease one of the following treatment schedules should be employed (1) Six hundred thousand units of crystalline procaine penicillin G (suspended in peanut oil containing 2 percent aluminum monostearate) on admission and again 72 to 96 hours after the first dose (2) Three hundred thousand units of depot penicillin on admission, 300 000 units at 48 hours and 600 000 units at 96 hours

b Patients with streptococcal infections who give a past history of rheumatic fever or who have evidence of rheumatic heart disease should be treated more intensively as follows Twenty-five thousand units of the sodium salt of penicillin every 3 hours for 8 to 10 days





# Protection of the Pulp

Stanley S. Cohen *Captain, DC, U S A.* (1)

**T**HE reactions of dental pulp to stimuli are different from those of any other tissue in the body. The pulp is less able to react in its own defense and generally initiates various degenerative processes as a result of mild injuries. This is because of its embryonic and undeveloped nature, its confinement in unyielding walls, and its copious blood vascular system and general environment. The functions of the pulp are to build and maintain the dentin and to transmit sensation. Various local irritants which may be traumatic, chemical, thermal, or electric, may elicit responses in the pulp from which it is incapable of recovering. These irritations stimulate the pulp tissue through the dentinal tubules and the dentinal fibrils in the tubules. Whether the mechanism of pulp stimulation is through impulses transmitted along the fibrils to sensory nerve endings in the vicinity of the odontoblast cells, or by means of hydrostatic pressure exerted on the tubules and transmitted to the nerve endings, or whether the fibril itself is a sensory nerve ending is not definitely known (2) (3) (4). When these stimuli are mild, the resulting changes are protective.

The pulp may initiate two constructive changes: calcification of the dentinal tubules (sclerosed or transparent dentin) and the formation of secondary dentin. Calcification is preceded by a fatty degeneration of Tomes' fibrils (5) followed by a precipitation of inorganic salts in the tubules. Under magnification these areas appear transparent or translucent in contrast to the opaque normal dentin. These tubules are impermeable to dyes, while normal tubules become completely impregnated. Sclerosed dentin is harder than normal dentin (6). It affords greater protection to the pulp from abrasion and the penetration of the

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(1) Walter Reed Army Hospital, Washington, D. C.

(2) Hill, T. J.: *Text-book of Oral Pathology*, 4th edition, Lea & Febiger, Philadelphia, Pa., 1949.

(3) Kronfeld, R.: *Histopathology of Teeth and Their Surrounding Structures*, 2d edition, Lea & Febiger, Philadelphia, Pa., 1939.

(4) Stokes, H. H.: *Oral and Dental Diseases*, Williams & Wilkins Co., Baltimore, Md., 1948.

(5) Bodecker, C. F.: *Fundamentals of Dental Histology and Embryology*, Columbia University Press, New York, N. Y., 1944.

(6) Dodge, H. C., and McKay, H.: The micro-hardness of teeth. *J. Am. Dent. A.* 20: 227, 1933. Quoted by Stokes, H. H.: *Oral and Dental Diseases*, Williams & Wilkins Co., Baltimore, Md., 1948, p. 309.

acids which cause caries. It reduces irritation of the pulp because of the absence of tubules to transmit impulses. This reaction takes place under carious lesions metallic fillings areas of trauma and erosion. It is the earliest and simplest form of constructive change that the pulp exhibits in response to the mildest type of irritation.

The formation of secondary dentin often accompanies the calcification of the tubules. Two types of secondary dentin are recognized and the type formed depends on whether any odontoblasts survive. Irrespective of type this secondary dentin is deposited over the pulpal end of the tubules and differs from the original dentin. The mechanism and chemistry of this process is unknown but Stokes (4) suggested that injury to the odontoblasts may be associated with resultant liberation of phosphates which account for the calcific deposit on Fish (7) has named these areas of secondary dentin dead tract because they no longer receive any nutrition and are impermeable to dyes. In ground sections with transmitted light they appear dark. If any odontoblasts survive a modified tubular type of dentin is deposited. The tubules in this dentin are fewer in number and coarser than those of normal dentin and run irregularly. The calcification is usually deficient. The deposition may begin after the laying down of a hyaline barrier or it may be a continuation of the primary dentin depending on the extent of injury to the odontoblastic layer. This type of dentin is usually laminated in appearance indicating periodic deposition.

When all the odontoblasts in an area die as a result of a more severe irritation a hyaline and/or cellular secondary dentin is laid down. This type does not contain tubules. It is often laminated as is the tubular variety and contains cells or not depending on whether the cells have a chance to retreat before calcifications occur. This depends on the speed of deposition.

In any event the rate of deposition of the hyaline or cellular type of dentin is usually more rapid than that of the tubular type. This is logical in view of the fact that any secondary dentin deposition is a protective reaction on the part of the pulp, and the greater the need, or the more severe the irritation the faster the pulp reacts. Gottlieb (8) has a different explanation for secondary dentin formation. He believes that (1) the odontoblasts form fibrils rather than dentin (2) the surrounding connective tissue forms the dentin, and it is excited to activity by stimulation through the fibrils (3) when the odontoblast layer is intact the activity of the connective tissue and hence the formation of secondary dentin is slowed down and (4) when the odontoblasts in any area are destroyed, the connective tissue comes into contact with the dentin and an area of increased secondary dentin formation results.

(7) Fish E. W. An experimental investigation of the enamel etc., London, 1932. Quoted by Rushton, M. A. Observations on Fish dead tracts in dentine. Brit. Dent. J. 68 11 13 Jan. 1 1940.

(8) Gottlieb B. Formation of secondary dentin and related problems. J. Dent. Research 23 22-34 Feb. 1946.

Bodecker (5) stated that the speed with which secondary dentin is deposited and the mechanism involved is not clear. What is known is that it is produced in response to irritation and it increases the distance between the pulp and the irritant, and thus protects the pulp. The reason why secondary dentin activity varies in different persons and in different teeth in the same person is obscure. Irritants of long standing that are not sufficiently severe to cause degenerative changes seem to favor secondary dentin formation.

The dentist is called on to restore teeth and to maintain their vitality. These teeth vary in the severity of their destruction and include the sound tooth, perhaps prepared for a bridge abutment, the carious tooth, the deep carious tooth or near exposure, the so-called pin point exposure, and the exposure either pathologic or caused by a fractured crown. The primary task is to induce the pulp to initiate these constructive changes without which little restorative dentistry could succeed. The pulp cavity is divided anatomically into the pulp chamber, found within the coronal portion of the tooth, and the pulp canal, found within the root (9). The outline of the pulp chamber varies roughly with the crown form and is continuous with the pulp canal. There is usually one pulp canal for each root, although sometimes a root contains more than one pulp canal.

The pulp cavity tapers from the crown to the apex, its size varying with the age of the tooth, its function, and history (9). Thus the ratio of crown to coronal pulp continually decreases throughout life because of the protective mechanism inherent in the healthy pulp. The first part of the coronal pulp to be obliterated by normal wear would be the prolongations of the pulp chamber called pulp horns. These correspond to the lobes of the tooth or the centers of calcification (9). When these horns are obliterated by the deposition of secondary dentin, the original outline of the pulp chamber can usually be seen because of the difference in color and translucency between the secondary and primary dentin. It is possible and often desirable to stimulate the pulp mechanically and so cause a similar deposition of secondary dentin which brings about a withdrawal or shrinkage of the pulp while maintaining its vitality. This is best and most safely accomplished by judicious cavity preparation and insertion of sedative dressings such as zinc oxide and eugenol. Gutta percha or temporary stopping is useless for this purpose. It does not stimulate the pulp to deposit dentin, and because it does not seal the cavity it allows it to become contaminated. Too much heat is required in placing the material, and it is certainly not easily worked and handled.

This subject of cavity sterilization is highly controversial. The standard one takes seems to depend to a large degree on one's beliefs regarding dental decay. Miller, in his chemioparasitic theory, believed that

(9) Wheeler, R. C. *Textbook of Dental Anatomy and Physiology*. W. B. Saunders Co. Philadelphia, Pa. pp. 271-272.

decalcification of the dentin preceded bacterial invasion. Thus removing all soft or involved dentin sufficed for the preparation of the cavity. Zander (10) believed that bacterial invasion of tubules preceded decalcification. He thus concluded that removal of all the involved dentin is not sufficient to remove all the bacteria and showed that cavities prepared in the usual manner are not sterile and cultures made 6 to 12 months after preparation yielded living organisms. Seltzer (11) corroborated Zander's work and suggested that the chances of mechanically removing all bacteria is slightly better than 50 percent. The bacterial involvement of prepared cavities was shown to vary directly with the depth of the original lesion.

This evidence would seem conclusive and yet there is discussion. Many dentists make no attempt at cavity sterilization and their clinical experience has been that there was no recurrence of decay under the filling. Experiment led Klein and Knutson (12) to conclude that the carious process stops when the oral environment is sealed off even in the presence of bacteria. It has been shown that the deposition of secondary dentin effectively blocks off any possible extension of the bacteria in the direction of the pulp. The lactobacillus dies off quickly when left under a filling but various strains of staphylococcus and streptococcus will persist for more than a year (12).

Bacteriologic studies lead us to accept the majority opinion that cavity sterilization is necessary or at least desirable. Thus we come to the question: Can it be attained? Seltzer (13) (14) examined various agents (table 1) and determined Morson's cresote to be the best. His results with physiological saline used as a control were better than with some of the more popular medicaments. He decried the use of 95 percent alcohol claiming that it produced pulp irritation and pain through its desiccant effect on the cavity wall.

Pure thymol crystal has a slight anesthetic effect as well as an antiseptic effect and so is of value in reducing dental pain (11). Thymol penetration is often insufficient to reach the micro-organisms responsible for the dental decay. It is highly recommended for its anesthetic effect following mechanical irritation incident to cavity preparation.

(10) Zander, H. A. Bacteria in the dentin after cavity preparation. Illinois Dent. J. 207 June 1940.

(11) Seltzer, S. Bacteriologic status of dentin after cavity preparation. J. Am. Dent. A. 27 1799-1801 Nov 1940.

(12) Klein, M., and Knutson, J. W. Studies on dental caries: Effect of anatomical throat irritate on caries in the first permanent molar. J. Am. Dent. A. 29 1420-1426 Aug. 1 1942.

(13) Seltzer, S. Comparative value of various medicaments in cavity sterilization. J. Am. Dent. A. 28 1844-1852, Nov 1941.

(14) Seltzer, S. Effectiveness of antibacterial agent used in cavity sterilization. J. Dent. Research 21 269-277 June 1942.

Markley (15) stated that he was dubious about the possibility of true cavity sterilization but was concerned with the contamination incident to cavity preparation. He recommended first working under a rubber dam. He pointed out the absolute necessity when using a sterilizing agent of recutting the cavity walls to remove the fine layer of medicament and so assure a good seal between tooth and filling material. Experimentation has shown that micro-organisms penetrate into dental tubules from 0.08 to 1.2 mm. beyond the hard surface of the underlying caries (11). Howe's ammoniacal silver nitrate which is generally credited with being the most penetrating sterilizing agent penetrates an average of 0.6 mm under the best conditions (16). This falls far short of the progress of the bacteria in the tubules.

TABLE 1—Comparative effectiveness of medicaments tested in the sterilization of dentin (1)

Medicament	Effectiveness (percent sterilization)
Morson's cresol	86
10 percent aqueous solution of iodine	78
Pure liquid phenol	69
Physiologic saline solution	47
Isotonic iodine solution	44
50 percent thymol in alcohol	39
50 percent phenol in alcohol	29
Howe's silver nitrate	28
95 percent alcohol	28

(1) Taken from reference footnote 13

Silver nitrate is admittedly bactericidal if it comes in contact with bacteria. Thus the surface of the dentin is sterilized and through the precipitation of the protein silver complex the dentin tubules are effectively blocked, and any residual bacteria are trapped on the one side by silver salt precipitation and the other by secondary dentin (13) (17).

Seltzer (13) and Klein and Knutson (17) believe that silver nitrate was a poor agent for cavity sterilization. They grant that it is bactericidal but claim it is too self-limiting because of its coagulation. Coolidge (18) and Ireland (16) credited silver nitrate with an irritating action on the pulp that causes the deposition of secondary dentin and thus with effectively checking the extension of the dental decay. It was also found

(15) Markley M. Statements from Lecture Delivered at the District of Columbia Postgraduate Clinic 14 March 1950.

(16) Ireland R. L. Ammoniacal Silver Nitrate as Sterilizing Agent for Deep-Seated Decay in Deciduous Teeth. *J. Am. Dent. A.* 26: 871-878, June 1939.

(17) McGehee W. H. D. and Green L. W., Pharmacology and Pharmacotherapeutics for Dentists. The Blakiss Co. Philadelphia Pa. 1948.

(18) Coolidge E. Treatment of Deep Dental Caries. *Illinois Dent. J.* 1: 363 May 1942.

(16) (19) that the penetration of silver nitrate is deeper in nonvital than in vital teeth and that although it is a pulp irritant when used in close proximity to the pulp contrary to former belief it does not of its own accord devitalize either deciduous or permanent teeth. Thus it may also be used in near exposures to induce secondary dentin formation.

Montr, Dorfman, and Stephan (20) obtained some diametrically opposed, yet interesting results. They found that the superficial layers of carious dentin were almost always infected, that intermediate layers were sometimes infected, and that partially decalcified dentin and sound dentin were almost always sterile. Working on the premise that it is often desirable and necessary in deep cavities to leave a small amount of carious or at least decalcified dentin in the floor of the cavity to avoid exposure of the pulp, they set up various experiments to determine whether it is possible to sterilize dentin without pulpal injury. They agreed with Miller that water-soluble substances such as iodine trichloride, mercury bichloride, and hydrogen peroxide were best for dentin sterilization, and that phenol was a poor penetrating agent. They further stated that oil of peppermint and oil of clove are worthless. They found saturated silver nitrate to be the best agent for dentin sterilization. Of 16 agents tested it was the only one that sterilized carious dentin from 0.8 to 1.5 mm. thick. They further found that the depth of penetration of an agent is greater than its depth of sterilization.

They concluded that saturated silver nitrate was the best agent available in that it would sterilize carious dentin to an average depth of 0.3 mm. by a 1-minute application and to 1.3 mm. in 10 minutes. They found ammoniacal silver nitrate to be slightly less effective, 30 percent hydrogen peroxide much less effective, and 20 percent zephiran chloride and 95 percent phenol almost useless. They further confirmed Howe's observation that silver nitrate penetrates sound dentin only slightly and concluded that a small amount of secondary dentin would prevent any silver nitrate from reaching the pulp tissue.

Treating exposed teeth has long been tried with little success, the usual eventual treatment being root canal therapy or extraction. The long series of disappointing results obtained with dozens of pulp capping materials has led most men to disregard this form of treatment. Glass and Zander (21) using calcium hydroxide demonstrated healing under the capping. Pulp capping is carried out to maintain the vitality of the tooth, but is justifiable only if healing results under the capping material. Previous work by Zander and others has proved that the pulp is capable of healing. In studying pulp amputations definite histologic

(19) Seltzer S., and Werther L.: Conservative silver nitrate treatment of bovine cases of deep dental caries. *J. Am. Dent. A.* 28: 1585-1594, Oct. 1941.

(20) Montr, J. A., Dorfman, A.; and Stephan, R. M.: In vitro studies on sterilization of carious dentin, evaluation of germicides. *J. Am. Dent. A.* 30: 1893-1900, Dec. 1943.

(21) Glass R. L., and Zander H. A.: Pulp healing. *J. Dent. Research* 28: 97-107, Apr. 1949.

evidence of dentin forming along the line of amputation was demonstrated

Glass and Zander (21) set up a controlled experiment to study the results of pulp capping clinically and histologically. They used sound young pulps in teeth to be extracted for orthodontic reasons. Using both calcium hydroxide with tap water and zinc oxide with eugenol alternately the teeth were exposed and capped and then extracted and studied after from 24 hours to 12 weeks after placing the capping. They found that pulp capped with calcium hydroxide remained free from inflammation and healed within 4 weeks but those capped with zinc oxide and eugenol showed no healing. Furthermore although the zinc oxide and eugenol cappings remained vital and showed no clinical symptoms during 12 weeks a chronic inflammatory reaction persisted at the site of exposure.

Seltzer (14) suggested that preliminary experiments with zinc oxide and creosote as a pulp capping agent warranted further investigation.

#### SUMMARY

There has as yet been little progress in protection of the pulp. We have learned much about the pathology and histology of the pulp in recent years. We have also increased our mechanical skill, have devised new and better preparations and restorations, and have discovered means to minimize thermal and mechanical shock to the pulp. Unfortunately too little basic bacteriologic and chemical work has been done. Research and investigation in this field are made difficult by the tremendous task of controlled experimentation *in vivo*. Although the various medicaments now used do not completely sterilize cavities, some operators do have success with one or another of them. This success seems to depend largely on the removal of all the carious material. In doing this we remove most, if not all, of the bacteria and so give the tissue a better chance to combat the process. Whether the tissue is able to react in its own defense depends on its ability to form secondary dentin. Age, systemic health, diet, heredity, and many other factors determine this. Undoubtedly the best way to enlist the aid of the constructive pulp changes, to be reasonably sure of removing all carious dentin and all bacteria, and to obviate the need for pulp capping, is to open and fill all cavities as soon as detected.





# Hemorrhagic Manifestations of Sickle Cell Disease

John E. Ryan, *Lieutenant, junior grade MC, U S N R. (1)*

Roger H. Fuller *Commander MC, U S N (1)*

**S**ICKLE cell disease is a morbid state caused by the presence in the erythrocytes of an inherited abnormal or defective hemoglobin which when reduced causes the cell to assume a typically crescentic shape. Persons having this abnormal hemoglobin in their red blood cells but not in sufficient concentration to allow significant sickling *in vivo* are said to have sickle cell trait. In the writings since Herrick's (2) original description of the disease attention has been focused most sharply on the anemia which is one of the chief features of the disease. Bauer (3) and others have pointed out, however, that the disease may be present without anemia. In fact the main threat to the health and life of the patient is not the anemia but the capillary stasis occasioned by intravascular sickling, conglutination and thrombosis. Death may ensue as a result of the generalized capillary plugging before anemia is manifest.

Another feature of the disease that has not been emphasized as much as the anemia is the hemorrhagic tendency which is occasioned by the capillary plugging and thromboses. Indeed hemorrhage may be the only manifestation of the disorder as is illustrated by case 1.

## CASE REPORTS

**Case 1**—A 21 year-old Negro previously well without antecedent trauma had been having painless hematuria for 2 months. He occasionally passed small clots in the urine. At times no blood was present in the urine. There was no frequency, nocturia or dysuria. He was previously treated for 6 weeks in an Army hospital where hematuria and albuminuria were noted. The cystoscopic findings were normal except for blood coming from the right ureter. His nonprotein nitrogen and blood

(1) U S Naval Hospital, Great Lakes, Ill.

(2) Herrick, J. B.: Peculiar elongated and sickle-shaped red corpuscles in case of severe anemia. *Arch. Int. Med.* 6: 517-521, Nov. 1910.

(3) Bauer, J. (Los Angeles): Sick cell disease; pathologic, clinical and therapeutic considerations. *Arch. Surg.* 41: 1344-1362, Dec. 1940.

pe's were normal. Retrograd pyelography was normal. Later he was admitted to this hospital where the roentgenographic examination of his chest was normal. Several urine specimens were grossly bloody with specific gravity as high as 1.024 and albumin as high as 4 plus. The Kahn test was negative. The erythrocyte count was 5,033 million with 15 grams of hemoglobin. The leukocyte count was 5,750 with 60 percent neutrophils, 35 percent lymphocytes, 4 percent monocytes and 1 percent eosinophils. The bleeding time was 2 minutes and 15 seconds; the coagulation time of venous blood was 10 minutes. The sedimentation rate was 6. Repeated cystoscopic examinations confirmed the bleeding from the right ureter. No acid-fast bacilli or tumor cells were found in the urine.

Because of his persistent hematuria and the impossibility of ruling out neoplasm and tuberculosis, a right nephrectomy was performed. The kidney weighed 190 grams with capsule that stripped easily from a smooth cortical surface which was extensively mottled with dark red and pale areas. The structures of the hilum appeared normal. On the cut surfaces there were large zones of opaque red discoloration underlying the red zones on the surface and extending through the cortex and medulla. Serial gross sections failed to reveal a neoplasm. In the mucosa of the pelvis and some of the calyces as well as the upper portion of the ureter were small hemorrhagic spots.

Microscopically the normal kidney architecture was preserved. The glomeruli, particularly in the red areas, were large with engorged capillaries stuffed with closely packed distorted red blood cells. The afferent arterioles were greatly dilated and plugged by these coagulated red blood cell masses (fig. 1). Erythrocytes were present in Bowman's space and in the lumina of the renal tubules. In many instances Bowman's space was distended and contained an eosinophilic protein precipitate. The tubular capillaries were also greatly dilated and stuffed with closely packed sickled red blood cells. There was fresh hemorrhage in the subepithelial tissues of the pelvic mucosa beneath intact epithelium. From the microscopic study it appeared that the source of the bleeding was glomerular capillary crisis with blood escaping from the glomerular capillaries into the renal tubules. No other cause of hematuria could be found. Following operation, the hematuria disappeared and the patient became completely symptomatic. Examination of his blood for sickling revealed none in the direct smear. Less than 1 percent of his red blood cells sickled in a sealed chamber after 24 hours. In the microscopic sections of the tissues which had been fixed in formalin, however, practically all of the red blood cells had assumed the sickled shape.

*Comment.*—In 1948 Abel and Brown (4) reported the case of a 26-year-old Negro who underwent a nephrectomy with an erroneous diag-

(4) Abel, M. S., and Brown, C. R.: Sick cell disease with severe hematuria and renal neoplasm. *J. A. M. A.* 136: 624-625, Feb. 28, 1948.

nosis of renal neoplasm without preoperative evidence to suggest sickle cell disease. The hematuria was ascribed by the pathologist to hemorrhage into the renal pelvis caused by sickled erythrocytes obstructing the vessels. In 1950 Goodwin et al. (3) reported seven cases of unilateral renal bleeding ascribed to sickle cell disease. It would seem

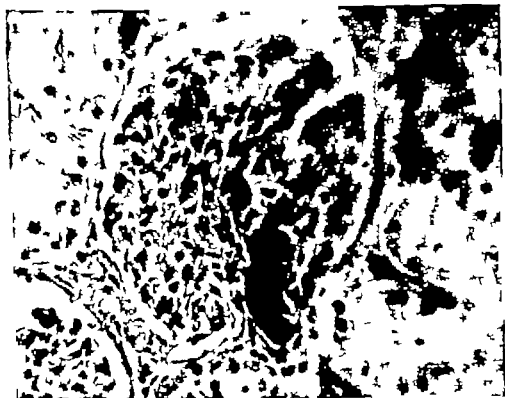


Figure 1—Case 1. Section of renal glomerulus showing capillary engorgement and plugging of the afferent arteriole by a conglutinated mass of erythrocytes.

apparent therefore that one of the causes of so-called essential hematuria in Negro or Negroid patients is sickle cell disease. In our patient bleeding was apparently focal and small in amount. So far as could be determined bleeding was not occurring from any organ other than the right kidney. It was speculated that some abnormality of the circulation of the right kidney may have allowed greater reduction of the hemoglobin and a greater degree of sickling at that site than elsewhere in the body. In a severe crisis of the disease however bleeding may be generalized although more severe in one locality than in others. This is illustrated by the following two cases.

**Case 2**—A left salpingo-oophorectomy was performed on a 24-year-old gravida 1 para 0 Negress early in the pregnancy because of an ectopic tubal pregnancy. She also had an intra-uterine pregnancy which

(3) Goodwin, W. E.; Alston, E. F.; and Semas, J. H.: Hematuria and sickle cell disease; unexplained, gross unilateral, renal hematuria in Negroes, coincident with the blood sickling trait. *J. Urol.* 63: 79-96, Jan. 1950.

Following operation, progressed satisfactorily under obstetrical supervision for epistaxis. About 1 week before admission he began mild epigastric pain, nausea and vomiting which became more severe. On admission to this hospital in the seventh month of her pregnancy she complained of frontal headache, difficulty breathing and pain and tenderness in the right upper abdominal quadrant. Her blood pressure was 120/80. Her lungs were clear. The abdominal findings were consistent with a 7-month pregnancy with viable fetus. A urine specimen, obtained by catheter, was grossly bloody and contained 4 plus albumin and no sugar. The nonprotein nitrogen was 27 mg. per 100 cc. The Kahn test was negative. After being in the hospital for about 6 hours she became comatose. Her blood pressure rose to 242/150. Fundoscopic examination revealed retinal hemorrhages which rapidly increased in size. Lumbar puncture released grossly bloody spinal fluid under 550 mm. of aqueous pressure.

The erythrocyte count was 4.86 million with 13.5 gram of hemoglobin. The leukocyte count was 21,000 with 69 percent segmented cells, 4 percent band forms, 17 percent lymphocytes, 5 percent monocytes and 5 percent eosinophils. The fetal heart tones disappeared and the patient died shortly thereafter with diagnosis of spontaneous subarachnoid hemorrhage.

The autopsy revealed a large cerebral hematoma in the left frontal lobe which had ruptured into the subarachnoid space and into the left lateral ventricle. The ventricular system of the brain was filled with clotted and unclotted blood. There were multiple small hemorrhages into the somatic muscles, serous membranes, peritoneum, pleura, pericardium, epicardium, endocardium, myocardium, gastric and intestinal mucosa and liver. The liver weighed 1,860 grams and was of normal shape. The external surfaces showed innumerable small red ecchymotic blotches beneath the capsule particularly on the superior aspect. On the cut surfaces large and small red hemorrhagic zones were scattered diffusely throughout but more prominently in the right lobe. The gross appearance of the liver suggested the hemorrhagic necrosis of eclampsia. The uterus contained a normal female fetus, 35 cm. long, weighing 910 grams, attached by normal umbilical cord to small placenta implanted in the fundus. Beneath the area of implantation were two small leiomyomas in the myometrium, the larger 3 cm. in diameter. There were two small foci of retroplacental hemorrhage and early dissection of blood between the uterus and fetal membrane. The placenta contained many areas of fibrosis and necrosis scattered through the organ. These were much more numerous than would be expected in a placenta of this age. There were no abnormalities of the fetus. The spleen weighed 165 grams. The capsule was thin. There were no scars or infarcts. The cut surfaces were normal except that they appeared unusually congested. There was moderate pulmonary congestion and edema. The kidneys together weighed 305 grams and grossly appeared normal.

The diagnostic impression from the gross examination was eclamptic toxemia of pregnancy with cerebral hemorrhage. Microscopically, however, sections of the tissues which had been fixed in formalin revealed in all organs marked engorgement and dilatation of capillaries and sinusoids. These were stuffed with masses of closely packed sickled red blood cells and were associated with interstitial hemorrhage. In many of the vessels the red blood cells were hemolyzed and it was noted that the ghosts had lost their distorted sickled shape and had assumed a globular form. In the spleen there was marked vascular and sinusoidal

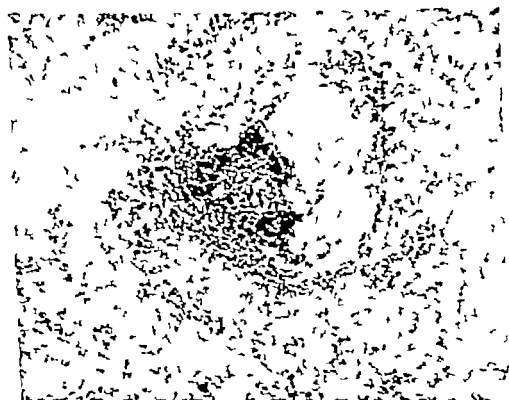


Figure 2.—Case 2. Section of spleen showing perfollicular hemorrhage

dilatation and engorgement. The perfollicular hemorrhages described by Rich (6) were easily seen (fig. 2). The lymphoid follicles appeared to float in large pools of blood. There was also hemorrhage into the red pulp. In fact the entire organ was flooded with sickled erythrocytes. Phagocytosis of these distorted cells was conspicuous. In the liver there was tremendous focal dilatation of the sinusoids in all zones of the lobule (fig. 3). In some of these greatly dilated sinusoids sickled red blood cells were tightly packed. In others the sinusoids contained the ghosts of hemolyzed erythrocytes. The hepatic cord cells were compressed and frequently had disappeared in the region of these dilated sinusoids. In the intervening areas the liver cells appeared healthy.

(6) Rich A. R. Splenic lesion in sickle cell anemia. Bull J Res Hopkins Hosp 43: 398-399 Dec 1928.

Sections of the placenta showed large areas of hyalinization of lobes with necrosis and intervillous fibrin deposits. There was decirculation of the decidua plate and hemorrhages consisting of maternal blood were seen. In the placenta almost all the maternal red blood cells were sickled although the fetal erythrocytes were not (fig. 4). The maternal cells did not stain as deeply as those of the fetus. Sections of the brain also showed dilatation and stasis of capillaries and small vessels caused by plugging with sickled red blood cells. There was some hemorrhage into the Virchow-Robin spaces. Blocks from the border of the large hematoma showed only fresh hemorrhage with no reaction to it. The vessels in the renal cortex were filled with red blood cells, most of which were hemolyzed. Apparently a shunting of blood had occurred into the medulla because the medullary vessels were engorged with tightly packed sickled red blood cells. There was definite granular degeneration of the tubular epithelial cell. The collecting tubules contained granular heme casts as well as red blood cells. Sections of the posterior portion of one of the eyes showed hemorrhage into the sheath of the optic nerve as well as into the retina. The pathologist's diagnosis was sickle cell disease in crisis with a large cerebral hemorrhage.

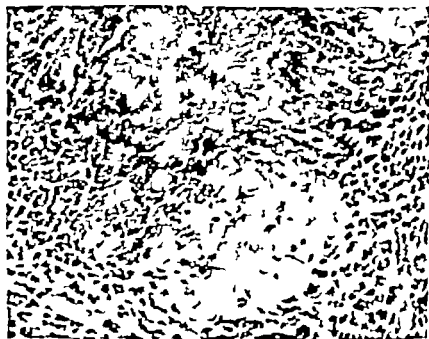


Fig. 3.—Case 2. Section of liver showing focal sinusoidal dilatation. Some sinusoids contain tightly packed sickled erythrocytes; others contain ghosts of hemolyzed erythrocytes.



Figure 4.—Case 2. Section of placenta showing sickling of maternal erythrocytes in sinusoids but not of fetal erythrocyte in vessels of chorionic villi.

Case 3.—An 18-year-old Negro was admitted to this hospital with severe abdominal pain. Two days prior to admission he had diarrhea. On the morning of admission he had had a rapid onset of continuous abdominal pain radiating to the lumbar vertebral region and legs. Physical examination showed lower abdominal tenderness without spasm, and tenderness over the lumbar spine. The erythrocyte count was 3.9 million with 11 grams of hemoglobin. The leukocyte count was 14,300 with a normal differential cell count. One urine specimen was negative but a subsequent specimen showed 1 plus albumin with no blood. Over a period of 2 days the patient's temperature rose to 103.8° F. He became irrational, showed icterus of the scleras for the first time and died shortly thereafter.

At autopsy there were petechial hemorrhages in the palpebral conjunctiva and in the serous membranes. There were hemorrhagic areas in the gastric and intestinal mucosa. The bowel contained blood at irregular intervals. The spleen was large, weighing 875 grams and bound down over the lateral surface by dense fibrous adhesions. The splenic capsule was thickened. The organ was firm. The cut surfaces were dark red-brown and the normal markings were obscured. The liver weighed 1,900 grams, was fairly firm, and the cut surfaces were red-brown with obscured markings. The kidneys appeared normal. There were epicardial and subendocardial hemorrhages. The pleural surfaces of the lungs



were densely speckled with small petechias. The cut surfaces of the lungs were pale and studded with dark red hemorrhagic blotches. The brain appeared normal. Microscopically there was generalized capillary dilatation and engorgement with sickled red blood cells. There was hemorrhage especially in the spleen, bowel and lung (fig. 5). The spleen showed several fibrous and siderotic scars as well as fresh perifollicular hemorrhage and tremendous engorgement of the sinusoids. Phagocytosis of red blood cells was prominent. Hemosiderin was abun-



Figure 5—C. Section of lung showing sickled red blood cells in one vein and dense fibrin in adjacent one.

dant in the liver, spleen and lymph nodes. The final diagnosis was sickle cell disease in crisis with pulmonary and gastrointestinal hemorrhage.

#### DISCUSSION

The pathogenesis of the bleeding in this type of patient is readily understood from an examination of the microscopic sections. Although bleeding time and clotting time are normal, the hemorrhage appears to be caused by plugging of the small blood vessels by masses of sickled erythrocytes. The impaction of red blood cells is favored by their abnormal shape and particularly by the unusually long flagella which many of the cells possess. These long whiplike processes are well

illustrated in the Rebeck et al (7) report of their electron microscopic studies of sickled cells. Anoxia leading to sickling interferes with the function of the red blood cells in the capillaries and in a fashion which gives rise to a vicious circle of sickle cell crises. The oxygen deprivation which initiated the anoxia is not well understood but certain factors such as anemia, anesthesia and mild shock have been implicated. In pregnancy which has an unfavorable influence on the disease, these factors have been an initiating factor.

Sickle cell disease is one of the intrinsic abnormalities which lead to increased blood destruction. It occurs almost exclusively in the Negro race although a few cases have been reported in the Mediterranean people. Wintrobe (8) reported the sickle cell trait as 7.3 percent in a series of 8,453 Negroes. In this trait 1 in 15 showed anemia. The trait is a hereditary constitutional abnormality of the erythrocytes which is characterized in the presence of decreased oxygen tension. Pauling (9) has shown an abnormality in the hemoglobin molecule.

One of the most recent reports on the clinical manifestations of sickle cell disease is that of Grover (10) who reported on 48 cases of active sickle cell disease during 10 years at Kings County Hospital, Brooklyn. The age at onset of symptoms before reaching 20 years of age and the age at death were 10 years and 35 years, respectively. The sex incidence was equal. 10 percent occurred in siblings. All had a temperature of 100 to 101 F and a pulse rate of 90 to 100. The most prominent symptoms were joint pains (70 percent), abdominal pain (48 percent), chronic ulcers of the extremities (25 percent), neurologic changes (17 percent) and severe epistaxis (1 percent). The enlargement of the spleen and liver was marked and rapid.

Hodges and Bernstein (11) reviewed the 23 reported cases of pregnancy in sickle cell disease. Eighteen were under 30 years of age, 9 had a history of spontaneous abortion, 9 had hypertension, and 6 died. Of 19 infants borne by mothers with sickle cell disease, 14 showed positive sicklelemlia. Hodges and Bernstein stated that the combination of albuminuria, edema, hypertension, convulsions and coma in pregnant women with sickle cell disease usually leads to the clinical diagnosis of eclampsia. Two of their patients suggested the presence of cerebral thromboses, hemorrhages or both. Their conclusion was that in sickle

(7) Rebeck, J. W., Woods, H. L., and Monaghan, E. A.: Electron microscopy of sickle cells. *Proc. Soc. Exper. Biol. & Med.* 68: 220-222, May 1949.

(8) Wintrobe, M. M.: *Clinical Hematology*, 2d edition. Lea & Febiger, Philadelphia, Pa., 1946.

(9) Pauling, L.: Sickle cell anemia—molecular disease. *Science* 110: 543-548, Nov 1949.

(10) Grover, V.: Clinical manifestations of sickle cell anemia. *Ann. Int. Med.* 26: 843-851, Jan 1947.

(11) Hodges, J. H., and Bernstein, J. B.: Sickle cell anemia and pregnancy. *Am. J. Obst. & Gynec.* 54: 108-113, July 1947.

**Case 6.**—An 18-year-old sailor who had been struck on the nose by a 2 by 4 inch piece of wood at the age of 6 years stated that this was followed by an abscess (septal?), which after healing left a saddle deformity and marked nasal obstruction. He had had some type of operation on the nasal septum when he was 9 years old with no improvement. Examination showed a marked saddle type of deformity and pronounced columellar retraction. The septum was thickened and irregular. Both fossae were inadequate. On 6 April 1950 a submucosal resection was performed and preserved septal cartilage implant introduced. On 8 September 1950 rhinoplasty with the insertion of a tantalum screen to bring up the dorsum was performed (figs. 17, 18 and 19).



Figure 17.



Figure 18.



Figure 19.

Figure 17.—Case 6. After insertion of preserved septal cartilage graft.

Figure 18.—Case 6. Two weeks after insertion of tantalum screen.

Figure 19.—Case 6. Roentgenogram showing tantalum screen in situ.

*Case 7* —A 21 year-old sailor had had a traumatic nasal deformity for 2 years. On 3 August 1950 a tantalum screen septocolumellar implant was inserted. On 17 August 1950 a rhinoplasty was performed. No dorsal implant was necessary (figs 20 21 and 22)



*Figure 20.*



*Figure 21*

*Figure 20.—Case 7 Prior to septectomy*

*Figure 21 —Case 7 Following septectomy*

*Figure 22.—Case 7 Roentgenogram showing tantalum septocolumella implant in place*



*Figure 22.*

## DISCUSSION

Seven patients in whom tantalum in the form of a screen was used in the correction of nasal deformities have been presented. Cases 1 and 2 had cancellous bone implants that absorbed the first operated on elsewhere the second from our service. These are 2 of 8 patients in whom we have seen return to the original contours following absorp-

sion of cancellous bone placed in the dorsum. These patients dampened our early enthusiasm for bone implants. The unsatisfactory eventual results following the use of paraffin, celluloid and ivory are well known. The failure of rib cartilage implants to form an organic union with the nasal bones or become fixed in the tissues leaves these grafts with an undesirable mobility. Curling, twisting and extrusion have all been observed by those who perform even a few corrective operations.

The use of a tantalum screen in the correction of the retracted columella in cases 1, 3, 4 and 7 illustrates the application of this medium to a very trying deformity. In selected cases we prefer it to cartilage because of its availability which obviates the cartilage bank and the annoyance associated with attempts to recover enough septal cartilage for an implant from an inadequate thinned, or irregular quadrangular plate. The screen is not as thick as cartilage resists retraction, is supportive and does not absorb. As a septocolumellar explant the screen is notched to fit over the nasal spine and kept long enough to reach the dorsum. We have yet to see more than minimal swelling, tenderness or extrusion of the implant. It is very important to cover the screen completely. In building up the columella-labial angle we find the screen quite suitable introducing it through the mucolabial fold above the incisor teeth and anchoring it if necessary to the nasal spine.

### CONCLUSIONS

Tantalum screen must be considered in the search for an ideal implant material in corrective nasal operations because it is readily available, adaptable, inert in the tissues, becomes firmly fixed, resists retraction, and lends itself to manual manipulation for the alleviation of subsequent traumatic displacements.

# Calcification of the Pericardium

James H. Forsee Colonel, MC U S A (1)

Harry W. Swan II MD (2)

Edwin M. Goyette Colonel MC U S A (1)

Harry P. Makel Major MC U S A. (1)

**C**ALCIFICATION of the pericardium is infrequently encountered in military personnel and still less frequently are such persons successfully operated on and returned to full military duty.

## CASE REPORT

A 22-year old white soldier was admitted to this hospital in September 1948 because of ill-defined abdominal pain. His symptoms subsided rapidly without specific treatment. Roentgenographic examination of the chest revealed prominence of the pulmonary conus and extensive calcification of the pericardium encasing almost the entire right ventricle and right auricle extending to the cardiac apex and ending abruptly on the diaphragm. The patient had no complaints referable to this condition. He was informed of these findings and surgical treatment was advised. He declined such therapy and was sent to duty and told to return if the condition became symptomatic. About 1 year later he began to note easy fatigability, shortness of breath and a feeling of constriction of the chest. Symptoms gradually increased to such a degree that he was quite short of breath on climbing one flight of steps and exhausted on climbing three. About 18 months after discharge he reentered this hospital because of these symptoms. A thorough clinical work-up revealed a radial pulse rate of 84 bilaterally, a blood pressure of 105/65 bilaterally and mild generalized peripheral adenopathy. The heart sounds were normal. A complete blood count, several liver function tests, sedimentation rate, A/G ratio and blood serum amylase were normal. The electrocardiogram was normal. The chest roentgenogram is shown in figure 1.

(1) Fitzsimons Army Hospital, Denver, Colo.

(2) The Department of Surgery, University of Colorado School of Medicine, Denver, Colo.



Figure 1.—Preoperative roentgenogram of chest showing extensive calcification of the pericardium.

Cardiac catheterization observations relative to the right ventricle, right atrial, superior vena cava, and femoral artery were made (table 1). Because of repeated bursts of ventricular ectopic beats the catheter was not introduced into the pulmonary artery. The peripheral end-diastolic pressure was 206 mm. of water and it exhibited no significant change after exercise. Together these findings suggested moderate constriction of the right ventricle.

TABLE 1 — *Findings on cardiac catheterization*

Source of specimen	Oxygen content (volam per 100 cc.)	Oxygen saturation (percent)	Pressure
Superior vena cava .....	14.1	76	13/3
Right atrial	13.0	70	13/3
Right ventricle	13.7	74	13/3
Femoral artery	18.3	99	—

Surgical exploration through a sternal T shaped incision with wide exposure of the heart was accomplished. An extensively calcified area



Figure 2.—Postoperative roentgenogram showing no evidence of pericardial calcification. The right ventricular shadow suggests greater diastolic filling.



of the pericardium involving the right ventricle, right auricle, superior and inferior vena cava, the inferior border of the heart and the adjacent diaphragm was removed. The pericardium of the left ventricle was largely free of calcification. The calcified plaque averaged 0.7 cm. in thickness and was stony hard. No specific cause could be determined. The postoperative course was uneventful. The venous pressure dropped to 94 mm. of water and the patient returned to duty. The postoperative chest roentgenogram is shown in figure 2.

Holman (3) and others (4) (5) have emphasized the characteristic features and methods for surgical correction of this condition. The patient herein reported had a marked pericardial calcification with early mild constriction and with symptoms which were completely relieved by operation, allowing his return to full military duty.

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(3) Holman, E.: Recognition and correction of constrictive pericarditis. *J. Thoracic Surg.* 18: 644-651, Oct. 1949.

(4) Pridal, O.; Castleman, B.; and White, P. D.: Chronic constrictive pericarditis: study of 53 cases. *Am. J. M. Sc.* 216: 361-377, Oct. 1948.

(5) White, P. D., Alexander, F., Churchill, E. D., and Sweet, R. H.: Chronic constrictive pericarditis over left heart chambers and its surgical relief. *Am. J. M. Sc.* 216: 378-383, Oct. 1948.

# Correction of Malocclusion After Unreduced Fractures

Ben W Oesterling, *Captain, DC, U.S N.* (1)

William B Johnson, *Commander DC, U.S N.* (2)

**I**N THE treatment of traumatic injuries of the facial bones the objectives should be (1) restoration of the function of the jaws (2) restoration of the occlusion of the teeth, and (3) normality of the facial contour. When compromises between these objectives are necessary the patient's desires and best interest must be considered and weighed. Facial and jaw fractures are seldom fatal but a deformity of the face is of great concern to a patient and can cause him much mental anguish. Facial deformities and additional operations are held to a minimum if prompt attention is given to even the slightest possibility or suspicion of a maxillofacial fracture. For these reasons consultation with the dental surgeon should not be deferred in cases in which a facial bone fracture appears to be an insignificant condition in comparison with the patient's general condition.

## CASE REPORT

A sailor was admitted to a U S naval hospital after having fallen from the gangway of a ship, striking his head and face on the concrete dock to which the ship was moored. On admission he was semiconscious and in shock. He was given 1 unit of plasma. His right wrist was fractured and he was bleeding from the nose and mouth. There was a deep wound in the lateral area of the right frontal bone. The right eye was closed and the orbital tissues were markedly edematous. The right eye was ecchymotic and was deviated outward and upward. There was no internal rotation and only limited external rotation. He could not move his eye downward. The pupils were dilated. The right ear drum was edematous. Palpation and observation of the face revealed a depressed fracture of the right zygoma. Because of the position of the right upper eyelid and the lowered level of the right eyeball it was thought that the floor of the orbit had been fractured and forced downward. A roentgeno-

(1) U S Naval Dental School, National Naval Medical Center, Bethesda, Md.

(2) U S Naval Academy, Annapolis, Md.

gram of the skull showed a comminuted fracture of the right lateral frontal region, with a large linear fracture extending to the left and upward across the frontal region.

Because of the patient's critical condition, only plasma, intravenous feeding and other supportive treatment were given during the 4 weeks following the accident and prior to consultation with the dental department staff. At that time there was still complete ptosis of the upper lid of the right eye (fig. 1). A lowered level of the right eyeball was considered to be the result of the depressed fracture of the right zygoma.



Figure 1.—Four weeks after injury. Not complete ptosis of the right eye and the depressed appearance of the facial contour on the right side.



Figure 2.—Malocclusion caused by fibrous union in the unreduced maxillary fracture.

discernable by palpation and by the appearance of the face. The upper anterior teeth and the left upper posterior teeth were completely out of occlusion (fig. 2). The buccal cusps of the right posterior teeth were in end-to-end occlusion with the lingual cusps of the lower right posterior teeth. The fractured maxilla was by this time firmly fixed by fibrous union. Roentgenograms showed (1) depressed fracture of the right zygoma, (2) what appeared to have been a complete horizontal fracture of the maxilla, and (3) fracture of the right mandibular condyle with no displacement.

*Stage 1 treatment (reduction of the maxillary fracture).—*Because clinical and roentgenographic examinations showed that the zygomatic fracture

was comminuted that there was antral involvement and that the right mandibular condyle was fractured an intraoral approach was decided on for reducing the zygomatic fracture. Under endotracheal gas and ether anesthesia an intraoral incision was made and the antral cavity entered. The fragments of the fractured zygoma were elevated into proper position. A Penrose drain was inserted and the fracture immobilized with an iodoform gauze pack. At the time of this operation the fracture line on the right side of the maxilla was apparent but the dense fibrous union which had already taken place prevented reduction of the maxillary fracture by manual manipulation at this stage. Recovery from the reduction of the zygomatic fracture was uneventful and the cosmetic result was good in that most of the facial deformity was corrected.

*Stage 2 treatment*—There remained the problem of correcting the malocclusion and the residual slight facial deformity not correctible by the first operation and which had resulted from the fibrous union of the fractured maxillary fragment in the depressed position. The oral surgeon decided against an extraoral appliance because of the other head injuries the patient had sustained. The prosthodontist therefore took hydrocolloid impressions from which a two-piece acrylic intraoral splint was made. The appliance (fig 3) was fitted and wired to the maxilla. One half of the appliance was attached to the teeth of the uninjured maxilla which served as the fixed base the other part was attached to the teeth of the fractured maxilla. By means of a jackcrew connecting the two



Figure 3.—The prosthetic appliance with jackcrew.



Figure 4.—Fixation of the maxilla and mandible with continuous loop wiring and elastic band traction.

parts of the appliance the displaced fragment of the maxilla was moved over a period of 1 week until the cusps of the right maxillary teeth had passed over the corresponding cusps of the mandibular teeth. The splint was then removed. Further correction, consisting of traction into correct occlusal position with the cusps as guide was effected by continuous loop wiring and rubber-band traction (fig. 4) and was complete



Figure 5.—Occlusion corrected and all intraoral appliance removed.



Figure 6.—Patient appearing on release from the hospital.

at the end of 3 weeks. The patient was released with the occlusion and the facial deformity corrected (figs. 5 and 6). While under treatment for the facial deformity and the malocclusion, there was gradual return of function of the external ocular muscles and of the upper lid. At the time of discharge he had almost fully recovered.

#### SUMMARY

A facial deformity and malocclusion, the result of unreduced zygomatic maxillary fractures were corrected by means of (1) intraoral operation and (2) the use of an acrylic intraoral splint with jackscrew followed by intermaxillary fixation.

# Wolff-Parkinson-White Syndrome

## Report of Two Cases

Jacob J. Robbins, *Lieutenant Commander MC, U. S. N.* (1)

**E**VER since the first cases of short P-R interval associated with prolonged QRS complexes in the absence of demonstrable heart disease were first clearly described and delineated by Wolff, Parkinson, and White (2) many reports of similar cases have established this syndrome as a fairly common clinical entity usually referred to as the Wolff-Parkinson-White syndrome. The purpose of this article is (1) to report two cases of this syndrome in which fairly complete electrocardiographic studies were made with unipolar and precordial leads (the literature contains only one such previous study (3)) and (2) to summarize the facts concerning this abnormality which appear to have been established and to indicate the varying opinions in matters still in doubt.

### CASE REPORTS

**Case 1**—A 19-year-old man was hospitalized because of general malaise and weakness of 10 days duration. His illness started with a sore throat and fever but these had subsided at the time of admission. He gave no history of chorea, rheumatic fever, scarlet fever, tachycardia, or other serious illness. His health record showed no previous hospitalization, but on physical examination on enlistment many extrasystoles were noted. His temperature was 98.6° F., pulse rate 80 and respirations 20. There was no swelling nor limitation of motion of any joints. The lungs were clear and there was no lymphadenopathy. Although the heart sounds were distinct and there were no murmurs the rate, rhythm, and force were grossly irregular and there was a pulse deficit of about 20 beats per minute (80 at the apex and 60 at the radials). The blood

(1) U. S. S. Sternbach.

(2) Wolff, L., Parkinson, J., and White, P. D.: Bundle-branch block with short P-R interval in healthy young people prone to paroxysmal tachycardia. *Am. Heart J.* 51: 685-704, Aug. 1930.

(3) Rosenbaum, F. F., Hecht, H. H., Wilson, F. N., and Johnson, F. D.: Potential variations of thorax and esophagus in anomalous triocentric excitation (Wolff-Parkinson-White syndrome). *Am. Heart J.* 29: 281-326, Mar. 1945.



pressure was 140/80. Routine laboratory studies were negative. The sedimentation rate was 6, and remained within normal limits throughout his stay in the hospital. A roentgenogram of the chest showed no cardiac enlargement and the silhouette was normal.

An electrocardiogram (ECG) showed many ventricular extrasystoles probably arising in the right ventricle which accounted for the irregular heart action (fig. 1). The supraventricular complexes were typical of the Wolff Parkinson-White syndrome. The P-R interval was 0.09 second in duration the QRS measured 0.14 second. There was typical slurring of the ascending limb of the R wave in leads I and 2. The T waves were upright in  $CF_1$ ,  $CF_2$ , and  $CF_3$ , deeply inverted in  $CF_4$  and upright again in  $CF_5$ ,  $CF_6$ ,  $CF_7$  and  $CF_8$ . R waves were absent in  $CF_7$  and  $CF_8$ . Repeated tracings taken while the patient was in the hospital showed little essential change from the original findings except for marked variation in curves which approached normal configuration. The administration of 0.3 gram of quinidine hourly for 4 doses resulted in practically normal tracings (fig. 2) but on the following day these had returned to the original forms. Atropine, digitalis, and exercise were prescribed

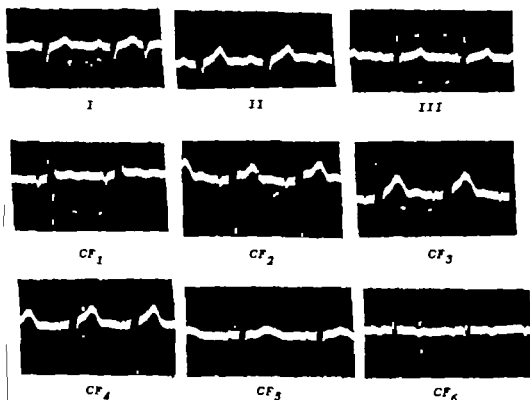


Figure 2—Case 1. ECG taken after the administration of quinidine. The tracing is within normal limits except for the biphasic T waves in  $CF_6$ .





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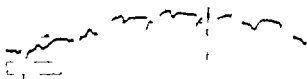
V2 (Lead II)  
normalV4 (Lead IV)  
normalV6 (Lead VI)  
normalV7 (Lead VII)  
normalV8 (Lead VIII)  
normalV9 (Lead IX)  
normalV9 (Lead IX)  
normal

Fig. 3—Case 3. All complexes were of the S-T-T pattern. The P-R interval was 0.08 second. The QRS complex is second of the left axis deviation and there is no evidence of any abnormality in left bundle-branch block.

but had no appreciable effect. In the 5 months he had no episodes of tachycardia and after that he was free from symptoms in spite of treatment.

**Case 2.**—A 20-year-old man was admitted with painful swelling of both ankles of 7 months duration. That 6 months previously he had similar swelling aboard ship for 3 weeks. He denied any other serious illness.

His temperature, pulse, and respirations were normal. There was a diffuse redness of the ankle joints with tenderness and restriction of motion. The sedimentation rate was 19. The white blood cell count was normal. A roentgenogram of the ankles showed curves typical of the Wolff-Parkinson-White syndrome. The P-R interval measured 0.08 second and the QRS complex of the R wave was slurred and notched in all leads. The T wave in the precordial leads to the right was deep and inverted. The QRS complex in the augmented left arm lead resembled  $V_6$  suggesting a right bundle branch block of the heart (fig. 3). Quinidine, atropine, digitalis were prescribed but produced no appreciable change in the electrocardiogram or these curves. The patient was hospitalized for 5 months during which time swelling of the ankle joints recurred. Although roentgenograms showed no bony changes these joints remained enlarged and their range of motion was restricted. At no time were any of the other joints involved. The sedimentation rate varied between 10 and 22. In view of this clinical picture a diagnosis of rheumatoid arthritis was made. The electrocardiographic findings were considered to be incidental.

## DISCUSSION

**Physiology.**—Although several theories explaining the electrocardiographic pattern in the Wolff-Parkinson-White syndrome have been presented the most satisfactory was advanced by Holzmann and Scherf (4) and Wolfarth and Wood (5). This theory is based on the hypothesis of an accessory pathway of auriculoventricular conduction through which the cardiac impulse is transmitted prematurely to one of the ventricles. The existence of such accessory neuromuscular connections was demon-

(4) Holzmann, M., and Scherf, D.: Über Elektrokardiogramm mit verkürzter Vorhof-Kammer-Distanz und politiven P-Zacken. *Ztschr. f. klin. Med.* 121: 404-423, 1932. Cited by Wolfarth, C. C., and Wood, F. C.: Further observations on mechanism of production of short P-R interval in association with prolongation of QRS complex. *Am. Heart J.* 22: 450-457 Oct., 1941.

(5) Wolfarth, C. C., and Wood, F. C.: Mechanism of production of short P-R intervals and prolonged QRS complex in patients with presumably undamaged hearts: hypothesis of accessory pathway of auriculoventricular conduction (bundle of Kent). *Am. Heart J.* 8: 297-311 Feb., 1933. Cited by Wolfarth, C. C., and Wood, F. C.: Further observations on mechanism of production of short P-R interval in association with prolongation of QRS complex. *Am. Heart J.* 22: 450-457 Oct., 1941.

Fabing of Cincinnati in his report of his visit to the Far East dated 30 December 1950:

Some general impressions I gained during my visit may be worthy of record. First and foremost is the Army residency training program. I feel that it saved the bacon in the Korean War and if it can never demonstrate another value this alone has proved its worth. The rapid transfer of these young men to the Far East provided the bulk of the medical personnel in the first 6 months of the campaign. If there had been no group like this to draw on, the shortage would have been tragic. As a group they are keen, willing and eager. They have done a worthwhile job and many have accepted responsibility beyond their years.

It was obvious that the Korean conflict could not be supported by the few medical officers on duty with the Army. Appeals were made individually to about 3,000 medical Reserve officers in the grades of captain and lieutenant. Only 41 responded with requests for active duty. The medical profession and our Congress readily recognized the situation, and on 9 September 1950 an amendment to the Selective Service Act providing for the registration and draft of physicians became law. The complexities and multiple agencies involved in the administration of this act brought many questions to the minds of all physicians.

The law itself divides physicians up to 50 years of age into 4 priorities for call to duty: (1) those ASTP or V-12 participants or deferrees in World War II who served 90 days or less after training; (2) those in the same categories who served more than 90 days but less than 21 months; (3) those who did not serve in World War II; and (4) those not included in priorities 1 or 2 who did serve in World War II. The law also provided for the establishment of a National Advisory Committee to the Selective Service System. These considerations in the law provide the facts necessary for this discussion.

When this law was signed the President communicated to the Secretary of Defense his belief that the priorities established in the Act appeared to be logical and fair both to the Government and to the individual affected, and further: "If as now seems certain we shall not be able to meet our needs for doctors and dentists by volunteer service it is my desire that the same priority of call be established for Reserve and non Reserve personnel. At that time the Army had only 38 medical Reserve officers who fell under the provisions of priority 1 and they had already been ordered to active duty. The Army had 1,429 on its rolls. Because the Army had no priority 1 personnel in its Reserve in the light of the President's statements and because the medical workload in the Army was increasing at the most rapid rate in history the Navy called 570 of its priority 1 officers to duty and loaned them to the Army. It is planned that 100 of these officers be returned to the Navy each month.

Medical problems since World War II have been thoroughly studied by committees high in Government affairs. These studies resulted in the

establishment of the Medical Advisory Committee to the Secretary of Defense and later also the position of Director of Medical Services in the Office of the Secretary of Defense and more recently in the evolutionary development of the Armed Forces Medical Policy Council composed of a civilian physician as chairman the three Surgeons General and three civilian physicians or dentists. Also resulting from some of these studies was the establishment of the Health Resources Advisory Committee in the office of the Chairman of the National Security Resources Board. The chairman of the latter committee is Dr. Howard Rusk. The President also appointed the members of this committee to the National Advisory Committee to the Selective Service System. Therefore the Rusk Committee as it is now commonly called wears two hats—that of the National Security Resources Board and that of the Selective Service System. In each State an Advisory Committee to the State Selective Service Board has been appointed, and these committees also will in effect work on problems of medical resources as well as on Selective Service matters.

This describes the superstructure which has to do with a physician coming to duty with the Armed Forces. The agencies concerned are the Army the Navy the Air Force the Office of the Secretary of Defense the Selective Service System the National Advisory Committee to the Selective Service System, the National Security Resources Board and, at the State level the Army Area Commanders and the State and local Selective Service Boards and their Advisory Committees. To understand how it all works it is necessary to drop back to mid-October when those in priorities 1 and 2 were registered by the Selective Service System. In addition to his registration form, each registrant completed a form outlining his training and experience and his desire as to acceptance of a commission in the Reserve. Following this registration the Navy and Air Force were flooded with applications for commissions and active duty. Both, within a short time granted commissions to all who could be used on active duty by their Departments up to July 1951. The Army also at this time had a number of volunteers from this group but insufficient to meet its needs. In order to effect maximum use of knowledge of local conditions the Army transferred all commissioning functions from Washington to the Army Area Commanders. The Navy and Air Force discontinued granting commissions to priority 1 registrants until the Army could catch up. We have not yet reached that goal. Those who had been classified in 1 A by local Selective Service Boards were ordered to take their preinduction physical examinations. About half of them indicated a desire to accept a commission and if qualified, they are granted commissions by the appropriate Army commander. They then are ready for call to duty as needed. On orders to active duty a physician may apply for delay and the Army commander is instructed to seek the advice of the State Advisory Committee in adjudicating his case.

On 22 December 1950 a new element was introduced into the picture in the form of a directive from the Secretary of Defense prescribing that all requirements for physicians and dentists be submitted to the Secretary of Defense for review in the Office of the Medical Policy Council and the National Health Resources Advisory Committee for approval. The directive further requires that the names of all those who are proposed for call to duty after 1 April 1951 be submitted to the National Advisory Committee to the Selective Service System for check for availability by its local committees before orders to active duty can be issued. Furthermore the names of all Reserve officers are to be submitted to the National Advisory Committee for determination of priorities of availability. Availability determination does not apply to those in Organized Reserve units or to volunteers. Since the Navy and Air Force are bringing only volunteers to duty this part of the availability determination appears at present to apply only to the Army. The check and balances are thus established.

Even these factors do not represent all the dispensations of the Federal Government to the individual physician. The ordinary maximum draft age (for other than the special draft of physicians and dentists) is 26, which in itself eliminates most of us because we ordinarily do not finish medical school before that age. We are at least allowed to finish our medical education, including an internship, before we are called by Selective Service. We are all eligible for commissions in the Armed Forces by virtue of our education. If we should be inducted we do not have to attend officers' candidate schools to obtain commissions as do members of the other professions. We begin our service as first lieutenants where others begin at a lower rank. We are entitled to additional pay of \$100 per month if we enter the service prior to call for induction. We are assured of pursuing our vocation in the service and our career systems assure that most of us will be continuously employed in accordance with our special training and experience.

As of 16 January 1951 only 1,327 had accepted commissions. This number is sufficient to meet our requirements through March, and orders will be issued promptly. Our April quota is 300 and at this moment there are insufficient resources to meet the Army's needs for April and none for May or June. If more priority 1 1-A physicians do not accept commissions promptly the Defense Department must place a requisition in the hands of the Selective Service System and inductions must begin. At its recent meeting in Washington, the National Advisory Committee recommended that all State committeemen urge priority 1 registrants to accept commissions without delay.

During the postwar years the Army has conducted many studies and established many policies affecting its requirements for medical officers. As a result medical Reserve units now leave most of their physicians and nurses home when they are called to duty and these join the unit when it is assigned an active mission. Table of Organization and

Distribution have been revised and economies made in every instance possible. Administrative functions and duties have been shifted to officers in the Medical Service Corps. A recent calculation of requirements when converted to ratios amounted to 3.8 per 1,000 troops. Under this calculation the Army would have one physician for about 600 persons (including dependents) for which it has medical care responsibility. This compares favorably with any of our large cities where complete medical care is rendered. Because a division in combat requires more medical officers than one in training, we resist calculation of our requirements by means of a ratio and want our contemporaries to know that we can calculate them with much more intelligence than by the blind use of a ratio.

The physical standards which are in use for priority 1 special registrants are the same as those being used for induction of enlisted men. The rejection rate is running 20.2 percent at present; 46 percent of those rejected were draftees during World War II. The physical examination of every rejectee is being reviewed in the Office of The Surgeon General before final decision is made and questionable cases are being reexamined. The principal causes of rejection are tuberculosis, neuropsychiatric conditions, heart ailments, and peptic ulcers. Many with physical deviations from Profile C (or 3) (physical standard in use) have been accepted for duty. A proposal that a category of those who are available for all except combat duty has been made. We cannot justifiably accept those who would only create a medical workload for those who are well (and this is a real possibility in cases in which motivation is at a low ebb).

The Army is accomplishing its medical mission in a superior fashion and it is approaching its medical personnel problems in an intelligent and forthright manner. It is our wish to cooperate with the civilian medical profession and those agencies set up to distribute the added defense load equitably among the members of an already fully occupied and busy profession. In view of the present world situation every physician must so plan his career that he serves at least one tour of duty with the Armed Forces of his nation; every physician must take an active interest in his Armed Forces medical services and encourage them in their efforts to maintain a strong, well-trained regiment; every physician must realize the gravity of the national situation and lend his efforts to obtain the physician required for the Armed Forces and at the same time cause a little less strain to civilian communities as possible. The physician must recognize the dispensations which are his insofar as military service is concerned and shoulder his full share of responsibility in his nation's efforts.

## A Proposed New Feature

### Listing of Articles Published in Other Journals by Personnel of the Medical Services of the Armed Forces

If a sufficient number of personnel of the Medical Services of the Army, Navy, and Air Force show an interest in furnishing information concerning articles which they have had published in other journals, this section will be made a permanent feature of the *Armed Forces Medical Journal*. Please give (1) the title of the article, (2) the names and ranks or rates of the authors, and (3) the name, volume and page numbers, and date of the issue of the journal in which the article was published.

—The Editors.

## BOOKS RECEIVED

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- Progressive Resistance Exercise Technic and Medical Application** by *Thomas L. DeLorme* B. S., M. D. Assistant in Physical Medicine Massachusetts General Hospital, Consultant in Physical Medicine Long Island Hospital Boston, and *Arthur L. Watkins*, A. B. M. D. Assistant Clinical Professor of Medicine Harvard Medical School Chief of Physical Medicine Massachusetts General Hospital. Foreword by *Joseph S. Barr* M. D. 245 pages; Illustrated. Appleton-Century-Crofts Inc. New York N. Y. publishers, 1951 Price \$5.
- A Textbook of the Practice of Medicine**, by various authors. Edited by *Fredrick W. Price* F. R. S. Ed. M. D. C. M. Ed. F. R. C. P. Lond. Hon. M. D. Bell. Consulting Physician to the Royal Northern Hospital and to The National Hospital for Disease of the Heart, London, formerly Physician and Honorary Pathologist to the Mount Vernon Hospital for Consumption and Disease of the Chest, and Examiner in Medicine at The University of St. Andrews. 8th edition. 2,076 pages. Geoffrey Cumberlege, Oxford University Press New York N. Y. publishers, 1950 Price \$9.
- Primer on Fractures**, Prepared by the Special Exhibit Committee on Fractures in Cooperation with the Committee on Scientific Exhibit of the American Medical Association. 6th edition. 109 pages; illustrated. Paul B. Hoeber, Inc. New York, N. Y. publishers, 1951 Price \$2.
- The Practice of Sanitation**, by *Edward S. Hopkins* Principal Assistant Engineer Bureau Water Supply Baltimore Maryland, Lieutenant Colonel, Medical Service Corps (Sanitary Engineering Section) United States Army Reserve Instructor, McCoy College, Johns Hopkins University formerly Special Lecturer, Western Maryland College; and *Frederic B. Elder* Engineering Associate American Public Health Association Colonel, Medical Service Corps (Sanitary Engineering Section) U. S. A. 423 pages; Illustrated. The Williams & Wilkins Co. Baltimore Md. publishers, 1951 Price \$7.50.
- James Lind, Founder of Naval Medicine** by *L. H. Roads* Surgeon Medical Corps, U. S. Navy 177 pages. Henry Schuman, Inc. New York N. Y., publishers, 1950. Price \$3.
- Clinical Parasitology** by *Charles Franklin Craig* M. D. M. A. (Hon.) F. A. C. S. F. A. C. P. D. S. M. L. Chief, Tropical Medicine Army formerly Director, Army Medical School Surgeon Major, Army Medical Center Washington D. C. Emeritus Professor of Tropical Medicine in the Tulane University of Louisiana, New Orleans La., and *Ernest Carroll Faust*, M. A. Ph. D. The Ellman Professor of Tropical Disease and Hygiene and Head, Department of Tropical Medicine and Public Health The University of Louisiana, New Orleans La. Consultant Surgeon General U. S. Army Consultant, U. S. Public Health Service with a



chapter on Control of Medically Important Arthropod by Albert Miles, B. S., L. S., Ph. D., Associate Professor of Parasitology (Medical Entomology) in the Department of Tropical Medicine and Public Health, The Tulane University of Louisiana, New Orleans, La., 5th edition, 1,032 pages; illustrated with 326 engravings and 6 colored plates. Lea & Febiger, Philadelphia, Pa., publishers, 1951. Price \$12.

Introduction to Surgery by Virginia Kneeland Frazer, M. D., Associate Professor of Surgery, College of Physicians and Surgeons, Columbia University; Assistant Attending Surgical Pathologist, Presbyterian Hospital, New York; and Harold Dorf Harvey, M. D., Assistant Professor of Clinical Surgery, College of Physicians and Surgeons, Columbia University; Associate Attending Surgeon, Presbyterian Hospital, New York. 233 pages; illustrated. Oxford University Press, New York & N. Y., publishers, 1951. Price \$2.75.

Nitrous Oxide-Oxygen Anesthesia, by F. W. Clement, M. D., Diplomate American Board of Anesthesiology, Fellow of the International College of Anesthetists; Fellow of the American College of Anesthetists; Member of the International Anesthetic Research Society; Member of the Ohio Society of Anesthetists; Chairman of the Section on Anesthesiology of the A. M. A., 1950; Past President of the Mid-Western Society of Anesthetists, 1932; Past President of the Associated Anesthetists of the U. S. and Canada, 1938; Formerly Director of Anesthesia at Flower Hospital, Mercy Hospital, The State Hospital for the Insane, Lehigh County Hospital, and Toledo Dental Dispensary Staff Anesthetist at Toledo and St. Vincent Hospital, Toledo, Ohio.—C. A. H. C. and R. A. M. C. 1914-1920 World War II.—M. C. A. U. S., A. A. F. 1942-1945. 3d edition. 369 pages; 129 illustrations. Lea & Febiger, Philadelphia, Pa., publishers, 1951. Price \$6.50.

The Differentiation of Escherichia and Klebsiella Types, by F. K. Hume, M. D., Chief, Infectious Salmonella Center, Stat Serum Institute, Copenhagen, Denmark. Publication Number 84, American Literature Series No. 57. 9 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill. Price 2.

Paul Ehrlich, by Marthe Marquardt, with an introduction by Sir Henry Dale. 255 pages; illustrated. Henry Schuman, New York & N. Y., publishers, 1951. Price \$3.50.

Encyclopedia of the Eye, Diagnosis and Treatment, by Conrad Berris, M. D., F. A. C. S., Executive Eye Surgeon, New York Eye and Ear Infirmary; Professor of Clinical Ophthalmology, Post-Graduate Medical School, New York University; President, Pan-American Association of Ophthalmology; Managing Director of the Ophthalmological Foundation, Inc.; President, Snyder Ophthalmic Foundation; and Edward S. Gelb, M. D., M. D., Attending Ophthalmologist, Champlain Valley Hospital, Plattsburgh, N. Y.; Associate Attending Ophthalmologist, Physian Hospital, Plattsburgh. 272 pages; 76 illustrations, including 42 subjects in color. J. B. Lippincott Co., Philadelphia, Pa., publisher, 1950. Price \$5.

Physical Diagnosis by Ralph H. Major, M. D., Professor of Medicine, The University of Kansas, 4th edition. 446 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher, 1951. Price \$6.50.

Functional Anatomy of the Limbs and Back, A Text for Students of Physical Therapy and Other Interests in the Locomotor Apparatus, by F. Henry H. Den Hartog, A. D., M. S., Ph. D., Head of the Section on Anatomy

Mayo Clinic Rochester Professor of Anatomy Mayo Foundation University of Minnesota. 341 pages; Illustrated. W B Saunders Co. Philadelphia, Pa., publisher 1951 Price \$6

**Current Therapy 1951** Latest Approved Methods of Treatment for the Practicing Physician, edited by Howard F Conn, M. D. Consulting Editors: M. Edward Davis Vincent J Derbes Garfield G Duncan, Hugh J Jewett, William J Kerr Perrin H Long, H Houston Merrill, Paul A. O Leary Wallis L. Palmer Robert A. Reimann, Cyrus C. Sturgis and Robert H. Williams. 699 pages. W B. Saunders Co. Philadelphia, Pa. publisher 1951. Price \$10.

**A Classified Bibliography of Gerontology and Geriatrics**, Prepared for Stanford University under a grant from The Forest Park Foundation, Peoria, Ill., by Nathan W Shock, Chief, Section on Gerontology National Institutes of Health and Baltimore City Hospitals. 399 pages Stanford University Press Stanford Calif. publisher, 1951 Price \$15.

**The Eye Manifestations of Internal Disease (Medical Ophthalmology)**, by I S. Tassman, M. D. Associate Professor of Ophthalmology Graduate School of Medicine University of Pennsylvania, Philadelphia, Attending Surgeon Wills Eye Hospital Philadelphia, Pa 3d edition. 672 pages, with 279 illustrations including 25 in color. The C. V Mosby Co., St. Louis, Mo., publisher 1951 Price \$12.

**The Psychology of Flight**, by Alex Varney 269 pages. D. Van Nostrand Co. Inc. New York, N Y publisher 1950. Price \$3 75.

**First Aid, Surgical and Medical** by Warren H. Cole M. D. F A C. S. Professor and Head of the Department of Surgery University of Illinois College of Medicine Surgeon-in-Chief, Illinois Research and Educational Hospitals, Chicago and Charles B. Puestow M. D. F A. C. S. Clinical Professor of Surgery University of Illinois College of Medicine and Graduate School; Chief, Surgical Service Veterans Administration Hospital, Illinois Illustrated by Carl Linden and Tom Jones 4th edition. 432 pages. Appleton-Century-Crofts Inc. New York, N Y publisher 1951 Price \$4.

**Militant Angel**, by Harriett Berger Koch R. N. 167 pages The Macmillan Co., New York, N Y publisher 1951 Price \$3

**Heart Disease, Its Diagnosis and Treatment**, by Emanuel G. Liberman B. S., M. D. Associate Attending Physician, Montefiore Hospital New York Cardiologist and Attending Physician, Lincoln Hospital New York Consulting Cardiologist, St. Joseph's Hospital Yonkers, Diplomate of the American Board of Internal Medicine Lecturer Columbia University 651 pages with 90 illustrations. Lea & Febiger Philadelphia, Pa., publisher, 1951 Price \$10.

**The Physiology and Pathology of Hemostasis**, by Armand J. Chute, Ph. D. M. D. Professor of Biochemistry Marquette University School of Medicine. 188 pages with 18 illustrations Lea & Febiger Philadelphia, Pa., publisher 1951 Price \$4

**Exodontia**, by M. Hillel Feldman, D. D. S. F I C. A. Director of Dentistry Lincoln Hospital Department of Hospitals City of New York Diplomate of the Board of Oral Surgery State of New York Fellow of the International College of Anesthetists Founder of the American Society for the Advancement of General Anesthesia in Dentistry Honorary Member, American Society of Anesthesiologists; with chapter on Dental Malpractice Jurisprudence, by Michael A. Hayes A. B. L. L. B. New

ber f th New York Dec 4th edition thoroughly revised 290 p ges  
with 322 ill tratio s. L & Febiger Philadelphia, Pa. publi bers,  
1951 Pd \$6.50.

An Introduction to Universal Serologic Reaction in Health and Disease by  
Reuben L. Kahn, D. Sc., University of Michigan Medical School and  
Hospital Ann Arbor, Mich. 155 pages; illustrated. The Commonwealth  
Fund, New York, N. Y., publishers 1951 Price \$3.50.

Trends in Gerontology by Nathan W. Shock, Chief, Section on Gerontology  
National Heart Institute National Institutes of Health, and The Bal-  
more City Hospitals 153 pages; illustrated. Stanford University Press  
Stanford Calif. publishers 1951 Price \$2.50

Psychosurgery in the Treatment of Mental Disorders and Intractable Pain, by  
Walter Freeman, D. Ph. D., F. A. C. P., Professor of Neurology  
Georgetown University Washington, D. C. and James W. Watt  
M. D. F. A. C. S., F. L. C. S., Professor of Neurological Surgery  
Georgetown University Washington, D. C. 2d edition. 398 pages;  
illustrated. Charles C. Thomas, Publisher, Springfield, Ill. 1950. Price  
\$10.50

The 1950 Year Book of Urology (October 1949 - October 1950), edited by  
William W. Hare Scott, M. D., Ph. D. Director James Buchanan Brady  
Urological Institute, Johns Hopkins Hospital, Urology-in-Charge  
Johns Hopkins Hospital Professor of Urology Johns Hopkins Uni-  
versity School of Medicine. 416 pages, Illustrated. The Year Book Pub-  
lishers Inc., Chicago, Ill., publishers, 1950 Price \$5.

Toxicology of Uranium, Survey and Collected Papers, edited by Albert Tannen-  
baum, M. D., Director, Department of Cancer Research, Medical Re-  
search Institute Michael Reese Hospital, Chicago; formerly Senior  
Chemist and Toxicologist, Cook County Coroner's Laboratory Chi-  
cago 333 pages; illustrated. McGraw-Hill Book Co., Inc. New York, N. Y.  
publishers, 1951 Price \$3.

## BOOK REVIEWS

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*Biological Standardization*, by *J. H. Burn*, Professor of Pharmacology at the University of Oxford; *D. J. Finney*, Lecturer in the Design and Analysis of Scientific Experiment in the University of Oxford and *L. G. Goodwin*, Member of the Staff of the Wellcome Laboratories of Tropical Medicine. 2d edition. 440 pages illustrated. Oxford University Press, New York N. Y. publishers 1950. Price \$6.75.

The pharmacologist engaged in research on standardization should not be without this excellent book. Although the book is not concerned with the action of drugs it is vitally concerned with how to measure this action. The authors with a basic scientific approach rarely seen in biologic texts have devoted about 40 percent of the book to units of measurement, classification of methods and statistical methods applicable to the particular problems of biologic standardization. The methods outlined by the authors, for the determination of mortality curve under the influence of various drugs, are as precise as any now available. The methods although illustrated only by problems in pharmacology could be used by workers in many other fields. The methods described are particularly valuable to the research worker whose problem calls for a careful evaluation of biologic variation between animals. This manual covers the biologic standardization of insulin, pituitary hormones, sex hormones, suprarenal hormones, thyroid and parathyroid substances, antipyretics and analgesics, digitalis, anthelmintics, antimalarial agents and many others.—*Commander A. P. Webster MSC, U. S. N.*

*Annual Report of the Reports of the Council on Pharmacy and Chemistry of the American Medical Association*, with the comments that have appeared in the *Journal of the American Medical Association* 1949-231 pages. J. B. Lippincott Co. Philadelphia, Pa. publishers 1950. Price \$2.

This collection affords the reader competent information on pharmaceuticals which are new to the subject of dispute. It includes sections on analgesics, chloroform, and organomercurial compounds and the omission of sulfathiazol from "New and Nonofficial Remedies." In addition, there is an article on statistics which should be helpful to many in the reading of scientific periodicals. This publication should be of interest with respect to current therapeutic trends for those who have no access to files of the *Journal of the American Medical Association*.—*Commander J. D. Wharton, MC, U. S. N.*

*Pneumoconiosis Beryllium, Bauxite Fumes Compensation*, edited by *Arthur J. Vorwald*, M. D. Director of The Trudeau Foundation and the Saranac Laboratory with the collaboration of *Manfred Bourditch*, A. B. *Thomas M. Durham*, M. E. and *Theodore C. Waters*, L. L. B. Leroy Upgarde Memorial Volume. 659 pages illustrated. Paul B. Hoeber Inc. New York, N. Y., publisher 1950. Price \$7.50.

This memorial volume dedicated to the late Leroy Upgarde, former director of the Saranac Laboratory and the Edward L. Trudeau Foundation, is the sixth in a series of Saranac Symposia devoted to the problems of pneumo-

conium and allied industrial hazards. The proceedings of this symposium were primarily devoted to beryllium. The history and industrial aspects are clearly evaluated in relation to the present industrial problem. The acute and chronic manifestations of beryllium poisoning are described and the pathology and physiology discussed briefly. Experimental investigations by various techniques are described and evaluated. Toxicity studies are reported in detail. Three papers are devoted to Shaver's disease which is restricted to workers inhaling the fume from the electric furnace used in the production of ferromanganese. The clinical characteristics, the roentgenographic manifestations, and the pathology of this disease are exceptionally well described. This volume will be of value to industrial medical officers. An extensive bibliography covers the pertinent literature concerning beryllium which has been published up to January 1940.—*Capt. C. B. G. Howary MC, U. S. N.*

**A Textbook of Chemistry** by Stella Goostrey R. N., B. S., M. Ed., formerly Director, School of Nursing, The Children's Hospital, Boston; formerly Educational Director and Instructor in Chemistry School of Nursing, Philadelphia General Hospital; and J. Rae Schwemck, A. B., Ch. E., Chairman, Chemistry Department, Sacramento Junior College; Lecturer in Organic Chemistry Sacramento State College; formerly Instructor in Nurses' Chemistry Sacramento Junior College in co-operation with Sacramento County Hospital and Sister's Hospital. 6th edition. 401 pages; illustrated. The Macmillan Co., New York, N. Y., publishers, 1950. Price \$3.75.

In the preface to this new book, the authors indicate that the aim of the text is to present the fundamental principles of chemistry which would be of service to the student nurse both in the practice of nursing and in understanding phenomena in other fields of applied science. They have presented chemical fundamentals in an interesting and lucid manner. The book employs the style made popular by Stenon in his classic "Great Chemistry." In addition to knowledge of atoms, molecules, elements, oxidation and reduction, ionization, gas laws, radioactivity, etc., common to inorganic chemistry the book also fully presents information on related fields. Modern chemistry is included in sections embracing colloidal, organic, and physiological chemistry. Sections are included which deal with bodily functions, the significance of basal metabolism, and blood and urine analyses are amply discussed. Each chapter begins with an outline of what is to be considered and closes with concise summary, clinical applications of the content, stimulating review questions are presented. A practical appendix and good bibliography are included. The format is good and the print and paper should promote easy reading.

—*Lieut. L. J. Bodenz, MSC, U. S. N.*

**A Laboratory Manual to accompany A Textbook of Chemistry** by Stella Goostrey R. N., B. S., M. Ed., formerly Director, School of Nursing of The Children's Hospital, Boston; formerly Educational Director and Instructor in Chemistry School of Nursing, Philadelphia General Hospital; and J. Rae Schwemck, A. B., Ch. E., Chairman, Chemistry Department, Sacramento Junior College; Lecturer in Organic Chemistry Sacramento State College; formerly Instructor in Nurses' Chemistry Sacramento Junior College in co-operation with Sacramento County Hospital and Sister's Hospital. 1st ed. 6th edition. 110 pages. The Macmillan Co., New York, N. Y. publisher. 1950. Price \$2.

In this manual 26 groups of experiments are presented which adequately cover the textbook matter. Lists of necessary reagents and procedures are provided, all making for an instructive easily comprehended practical review of theory.—*Lieut. L. J. Bodenz, MSC, U. S. N.*

**Projective Psychology** Clinical Approaches to the Total Personality by thirteen leading exponents of projective techniques, under the editorial direction of *Lawrence Edwin Aft*, Ph.D. Research Associate in Psychology College of Engineering New York University and *Leopold B. Hask*, M.D. Lecture in Psychology School of Education, New York University. 494 pages; illustrated. Alfred A. Knopf New York, N.Y., publisher 1950 Price \$6.

This book describes the theory and practice of projective psychology and was designed to provide a reference material for the various projective techniques used by the clinical psychologist. This objective has been attained. The book is divided into three parts. Part I presents the theoretical foundations of projective psychology. Part II contains separate papers devoted to various projective tests used in clinical psychology. Each paper has been prepared by a leading exponent of a certain technique indicating its special advantage. The result is a series of valuable contributions concerning such techniques as the Rorschach test, the thematic apperception test, the mosaic test, figure drawing, the Szondi test, the Bender visual-motor Gestalt test, the sentence completion test, and finger painting. Part III is devoted to an explanation of the application of projective techniques to business, industry and action research. This book is recommended as a useful reference for clinical, educational, and industrial psychologists. It is particularly well suited for the psychiatrist who desires to become more familiar with the clinical psychologist's repertoire.

—J. E. Rudasins

**Physiology and Anatomy** by *Esther M. Greiselman*, B.S. in Education N.A., Ph.D. M.D. Professor of Physiology Temple University School of Medicine, Philadelphia, formerly Professor of Physiology Woman Medical College of Pennsylvania Philadelphia; formerly Assistant Professor of Physiology the University of Minnesota Minneapolis. 6th edition. 841 pages 478 illustrations including 52 in color. J. B. Lippincott Co. Philadelphia, Pa. publishers 1950 Price \$4.

In this book the fundamental of anatomy and physiology are presented. Clarity and simplicity are achieved by the logical manner in which the subject matter is presented and by the numerous excellent illustrations which include drawings, photographs, and roentgenograms. For the student's general information, each chapter contains a section in which the author relates the material to common pathological conditions. This adjunct, included solely for general interest, serves, by comparison, to stimulate the student's interest in the normal anatomy and function of the human body. Recent advances and the newer technique in physiology are discussed and references to the original articles are cited. A brief section on aviation physiology introduces the student to problems peculiar to this rapidly expanding field. This is an excellent textbook for the nursing and physical education student, and a concise up-to-date reference book for the graduate nurse or instructor. —N. V. Ricchetti

**Meat Hygiene** by *A. R. Miller*, D.V.M., LL.B., Chief of the Federal Meat Inspection Service U.S. Department of Agriculture Washington D.C. 420 pages illustrated. Lea & Febiger, Philadelphia, Pa. publisher 1951 Price \$7.50

This book is well written and covers the general subject of meat inspection hygiene and regulatory procedures related thereto concisely but thoroughly. The subject has been developed in such a way that the book is of value not only to personnel engaged directly in meat inspection and hygiene but to those indirectly concerned. This volume would be of value to Army veterinary officers who engaged in ante- and post-mortem inspections (particularly in theater of operation overseas). —Brig. Gen. J. A. McCallum, V.C., U.S.A.

**Psychosomatic and Suggestion Therapy in Dentistry** by Jacob S. Solenberg, D. D. S. 152 pages illustrated. Philosophical Library New York N. Y. publisher 1950 Price \$3.75

This book can be recommended to the dental profession as a reminder of that part of patient-dentist relationship lost in the heavy workload of present-day practices and means of conducting positive approach to aggressive conditioning and control of the patient. Following background material the psychosomatic concept as applied to dentistry the author discusses suggestion therapy in dentistry. Self analysis is a valuable by-product of this book.

—Lt. Col. F. B. Sowers DC, U. S. A.

**Pulmonary Ventilation and Its Physiological Regulation**, by John S. Gray M. D., Ph. D., Professor of Physiology Northwestern University Medical School Chicago Ill. Publication No. 63, American Lecture Series, 82 pages, illustrated. Charles C. Thomas Publisher, Springfield Ill. 1950. Price \$2.

This book monograph pulmonary ventilation is clearly and concisely written. The author describes the effects of change in blood pH, CO<sub>2</sub> concentration, and anoxia on the respiratory system. It shows the pulmonary ventilation is result of integrated regulation based on what is happening to the blood CO<sub>2</sub>, O<sub>2</sub>, and pH. It further shows that there are other factors

controlling pulmonary ventilation which have not yet been determined and makes it clear that in studying this physiologic phenomenon it is not easy to distinguish between the steady state in which there is a steady relation between arterial concentration of the arterial chemoreceptors at the surface and the steady state in which these concentrations are changing. It believes that many of the errors in interpreting results of present experiments were caused by failure to distinguish the steady and unsteady state. The flight surgeon or other physician interested in aviation medicine will find this monograph valuable in interpreting the effects of altitude on pulmonary ventilation. For the general practitioner there are sufficient references to clinical conditions to make his book interesting.

—M. J. J. N. S. boffer U. S. A. F (MC)

**Clinical Orthoptic Procedures: A Reference Book on Clinical Methods of Orthoptics** by William Smith O. D., Associate Instructor in Optometry and Instructor of Orthoptic and Vision Training Massachusetts School of Optometry Boston, Mass. 393 pages illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950 Price \$8.

This book is published as a reference work on clinical methods of orthoptics. It aims to present the technique and results of orthoptic training for not only the technical anomalies of ocular position and amblyopia, but also reading problems, accommodative anomalies, myopia control, hysterical blindness, strabismus, and strabismic amblyopia. The author has extensively perused the literature and is familiar with the products of almost every manufacturer of mechanical orthoptic instruments. To submit the value of this book to members of the military service is difficult because the material presented from the viewpoint of the nonmedical practitioner and depends only on the technical available. The results quoted by the author are phenomenal. He claims that, in his hands, orthoptic treatment alone has cured defects for which ophthalmologists require cycloplegics, hormones, mydriatics, and dilators. Unilateral educative psychotherapy, vitamins, and surgery. There are however sufficient laudatory clinical evidence to show that it is open to reasonable doubt.

Although the book includes many worthwhile quotations from other writings, various of the author's own statements are questionable unproved, self-contradictory or meaningless. Any medical officer who has re-examined recruits enlisted on the visual credibility statements of a civilian optometrist, would tend to read with some disbelief the case records of examinees previously disqualified for ocular defects who qualified for enlistment, aviation duty admission to the Armed Forces academies, and direct commissioning after only a few of the author's treatments. Procedures are fairly well described although there might be some objection to the dependency on commercial machines for effecting them.

The glossary of terms at the end of the text is presented at the high school student's level and the bibliography is weakened by the lack of a correlating key. Although the book is not without interest, to try to obtain workable orthoptic information from it is comparable to studying a proprietary drug's action from only the descriptive literature distributed by the manufacturer.

—*Commander E. J. Olenick, MC, U. S. N.*





# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
Agency Department of Defense*



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THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY  
THE DIRECTOR OF THE BUREAU OF THE BUDGET OCT 10, 1949

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON 1951

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Any reference in an article of the publication to a proprietary drug or to a chemical formula shall constitute an endorsement of its efficacy or use in the treatment of a condition.

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#### INDEX

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THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

Current List of Medical Literature

(Army Medical Library) Monthly listing of journal contents. List of other index monthly from last issue.

Quarterly Current Index in Medicine

(American Medical Association) Author and Subject

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

The Chairman of the Armed Forces Medical Policy Council and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

RICHARD L. MEILING, M. D.,  
*Chairman, Armed Forces  
Medical Policy Council  
Department of Defense*

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Surgeon General U. S. Army*

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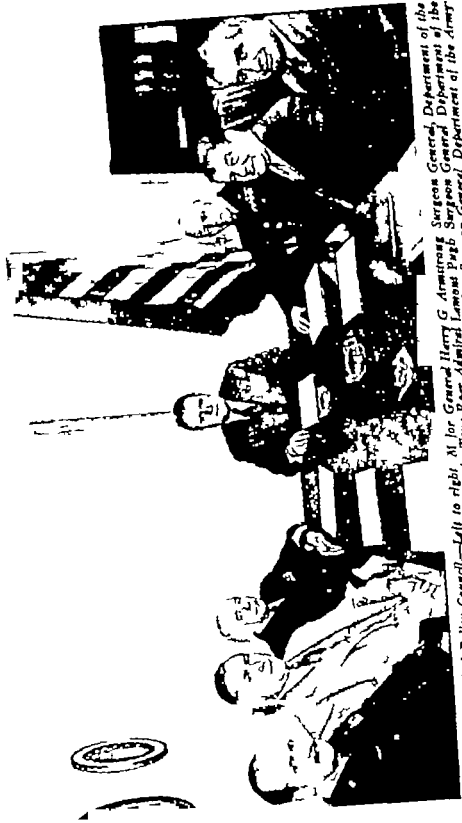
*Colonel, Medical Corps*

*United States Army*

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Armed Forces Medical Policy Council.—Left to right: Major General Harry G. Armstrong, Surgeon General, Department of the Army; Major General Raymond W. Ellis, Surgeon General, Department of the Army; Major General Lovelace H. M. D. Albuquerque, N. Mex.; Major General Raymond W. Ellis, Surgeon General, Department of the Army; Major General Raymond W. Ellis, Surgeon General, Department of the Army; Major General Raymond W. Ellis, Surgeon General, Department of the Army; and Major General Raymond W. Ellis, Surgeon General, Department of the Army.





OFFICE OF THE SECRETARY OF DEFENSE  
ARMED FORCES MEDICAL POLICY COUNCIL  
WASHINGTON 25, D.C.

**MEMO:** Personnel of the Medical Services, The United States Armed Forces.

The Department of Defense recently asked the Subcommittee on Shock of the National Research Council to recommend to the Department of Defense plasma substitute (antishock solution) that could be stockpiled immediately for emergency use. As result of this request the Subcommittee recommended that the Kock P-20 type gelatin and dextran be stockpiled. Industry and the research agencies are continuing investigative work on other materials of similar character.

Since receiving this recommendation the Armed Services Medical Procurement Agency has already begun negotiating with industry for the purchase of these two plasma substitutes, primarily dextran.

These plasma substitutes are not intended to supplant whole blood or blood derivatives, but are for the present to be stockpiled only for emergency use and until adequate amounts of plasma or other blood derivatives can be obtained to meet the requirements of the Department of Defense.

*Richard L. Helling*  
Richard L. Helling M.D.  
Chairman

# UNITED STATES ARMED FORCES MEDICAL JOURNAL

Volume II

March 1951

Number 8

## Coronary Heart Disease in Mid-century With a Note Concerning Its Military Importance<sup>1</sup>

PAUL D. WHITE, M. D.

IT IS now 260 years since Theophile Bonet published the description of a fatal case of coronary occlusion, 182 years since Heberden's classical account of angina pectoris, 151 years since Parry published Jenner's letter relating angina pectoris to coronary artery disease, and 38 years since Herrick established the clinical picture of myocardial infarction. Yet only now very belatedly are we physicians beginning to undertake in anything like an adequate degree fundamental researches into the cause of the serious coronary artery atherosclerosis which is without doubt the most important of the threats to the health of man in civilized countries today. This disease has changed the course of history of families, communities, States, nations, and even of the world itself by crippling or killing some leader or group of leaders at the height of their careers in business, profession, or government. Of all kinds of heart disease it is the most important, not only because it is common the world over and serious but also because a concerted effort to discover its cause, or causes, has been so tardily established.

Pathologists for 100 years have described myocardial necrosis and scarring and for 25 years or more have presented to us pictures of the atherosclerotic lesions of the coronary arteries themselves but only very slowly have we physicians fitted these things into our practice of medicine in relation to diagnosis, prognosis, and treatment, and especially into the field of preventive medicine which though most difficult is also the most important of all. To practice preventive medicine intelligently we must understand the causes of disease and

<sup>1</sup>Presented at the Monthly Medical Meeting, 14 December 1950, Army Medical Center Washington, D. C.

so etiologic researches are fundamental. Hence although I shall first mention some advances in diagnosis, prognosis and treatment of coronary heart disease in the last decade I shall discuss mainly a search for clues of causes of serious coronary atherosclerosis.

*Diagnosis.*—In the past and still indeed today the most useful and often the only way to establish the diagnosis of coronary heart disease is by careful and experienced history taking. The all important symptom of angina pectoris in its various manifestations and degrees and the more prolonged pain of acute myocardial infarction account for at least 75 percent of the cases. Electrocardiographic confirmation is common in such cases, but diagnosis by electrocardiogram (ECG) alone occurs in only a minority. Nevertheless careful and experienced interpretation of ECG and in particular the use of the unipolar precordial leads, will uncover a significant number of persons with otherwise silent coronary heart disease. Rarely is it necessary (or even wise) to resort to tests of exercise or low oxygen inhalation.

*Prognosis.*—We have learned in the last 2 decades that, despite the uncertainty of the prognosis in any individual case of coronary heart disease most patients with angina pectoris or acute myocardial infarction survive for years and many regain a good state of health and activity with disappearance of angina pectoris through the development sometimes slow of an adequate compensatory collateral coronary circulation, or with sound healing of the infarct the scar involving a minor part of the overabundant mass of left ventricular muscle. Any person with obvious coronary insufficiency can die suddenly soon after the beginning of the illness, as indeed may a person never sick before but the great majority weather hundreds or even many thousands of individual episodes and may eventually with the application of common sense the healing action of Mother Nature herself and a certain amount of good luck be quite well again 10 or even 90 years later. Indeed I have followed so many thousands of cases personally that I think of at least a touch of coronary heart disease as being a more or less normal event in middle or older age in the case of a robust man.

*Treatment.*—Unhappily we have as yet no specific cure for coronary heart disease despite the many remedies that are periodically announced and as quickly subside in popularity. Nor should we expect to find any sure fire treatment. We are dealing with corroded and obstructed arteries which cannot be quickly or even slowly cleared either chemically or physically. Surgical methods of bringing in new blood supply via anastomoses from an irritated pericardium or by transplant from omentum or thoracic muscles or omentum have not been

shown as yet to do better than, or even as well as, the natural development of a collateral circulation although I do not in any way deprecate the value of continued efforts along this line. Nor can we as yet clear the obstructed coronaries by endarterectomy as the French surgeons have ingeniously done in some cases of obstructed iliac and femoral arteries.

Of all drugs only the nitrites, in particular nitroglycerin and erythrol tetranitrate, have with the passage of time proved their widespread worth in alleviating symptoms and perhaps prophylactically saving lives. Other medicines, especially aminophylline, sedatives, khellin, and alcohol have had either limited value in relatively few cases or have had too many unfavorable side effects. Some drugs have been essentially inert, such as vitamin E, papaverine, and oxygen. In rare cases, however, well under 1 percent, the medical production of myxedema by irradiated iodine has been a godsend when for many months or years the daily occurrence of angina pectoris has rendered a patient an unhappy and miserable invalid. Indeed as symptomatic treatment this use of irradiated iodine has largely supplanted the sympathetic nerve resection or injection which we used to carry out in rare cases.

Dietary treatment is likewise unsatisfactory. The avoidance of hearty meals and the reduction of overweight by limiting caloric intake have their undoubted value but except for those reasons or a possible long range prophylactic purpose the exclusion of certain foods, in particular cholesterol fats (butter, cream, and eggs) and the inclusion of other foods or drugs directed to affect cholesterol metabolism such as choline, inositol, and lecithin have not yet been adequately evaluated. Much of the cholesterol in the body is apparently of intrinsic origin, synthesized in liver or other tissue from carbohydrates, protein, and fat ingested.

And so we come to the most important aspect of coronary heart disease, namely, its cause and thereby prevention. Although we know very little as yet about the etiology of serious coronary artery atherosclerosis, I should like to summarize some of the aspects of the subject that we have been studying in Boston and which others elsewhere have been exploring. The challenge at last is being met and the more well trained persons we can put on these researches and other studies of this vitally important disease the sooner we shall have some illuminating answers. I do not doubt but that in the next 20 or 30 years we and our successors will discover new facts which may help us to decrease the incidence of crippling coronary heart disease in our middle-aged citizens and to add life to years as well as years to life. I shall take up in order of apparent importance a number of factors that have already appeared to be of significance in a research

that we have been carrying on in Boston on young persons who developed evidence of coronary heart disease under the age of 40 years. We believed that in this youthful group we might discover the most important clues. In 1937 Dr Glendy Dr Levine and I analyzed briefly 100 cases of coronary heart disease in this age group. The second World War prevented a fuller study of the subject then but in 1947 Dr Levine and I resumed our research with the help of Drs. Sprague, Bland, and Lerman and especially of Dr Gertler and of our anthropologic colleague Dr Garn and with the advice of Dr Hamilton of Long Island Medical College expert in the biology of sex. We collected a new series of 100 patients under the age of 40 years who had had acute myocardial infarction and 140 normal controls and carried out for over 2 years much more intensive studies than in the case of the earlier group. We were helped to do this by a grant from the Commonwealth Fund of New York City.

*Sex.*—Most striking of all has been the factor of sex. In our first series of 100 young patients 96 were men and only 4 were women; in our second series of 100 there were 97 men and but 3 women. Thus there was a total ratio of more than 24 to 1. Why this was so we do not yet know. What studies we have made of endocrinologic interest do not explain it but these have been far from complete. Interestingly enough the urinary content of 17 ketosteroids has been reduced in our patients but this finding may be perhaps in part explained by the fact that most of them had undergone weeks of bed rest, though not within 6 months of the study and had reduced their activity since. This vital clue of sex incidence remains unexplained and requires much study. Is it part of the seeming law of nature whereby the males of all species in the animal kingdom from earth worms and insects up through mammals live appreciably shorter lives than do the females? In the United States of America today a girl baby at birth has an average expectation of a bit over 70 years of life while a boy baby has something more than 4 years less. Is the male born with a thicker coronary artery wall to start with as has been suggested by certain observers, and if so, why?

*Body build.*—Of next importance seemingly in our study has been body build. Anthropologic techniques have proved that most of the young patients, male or female, are of husky build, not just fat but rather muscular. Physical anthropologists divide the human race into three main groups according to body build: (1) endomorpha, or those with rotund shapes and considerable deposition of fat; (2) mesomorpha, those with stocky frames endowed with much muscle; and (3) ectomorpha, those with long slender frames and bones with relatively little fat or muscle. To be sure there is usually a mixture of two of the three elements in most persons, and so they are graded

according to the relative amount of each present numerically from 1 to 7 (that is, from little or none to a maximal amount) Thus a person graded as 2-6-1 would have some degree of endomorphy, a great deal of mesomorphy, and practically no ectomorphy In our young coronary patients there was a great preponderance of mesomorphy slight to moderate endomorphy and little ectomorphy There were no preponderantly ectomorphic patients in the entire series. Why is this? We don't know Does it mean that muscular metabolism may play an important role, perhaps more important even than cholesterol metabolism? That also we don't know It has not yet been studied. We have much to do and to learn. I might add that the occupations represented in our series were mostly the professions and white-collar jobs, there were but few hard working laborers and farmers, but that may have been caused in part by the selection of patients that were sent to the study for the most part by consultants. A broader collection of patients should sometime be made to determine how representative our group is.

*Blood cholesterol and other lipids*—A third but less clear clue from our study and that of others has been the finding of a distinct tendency for an elevated level of cholesterol in the blood (200 mg per 100 cc. was the mean for our coronary patients as compared with 225 for our controls) There is a wide range, however there being many exceptions. Some of our young patients with coronary heart disease had normal or even low blood cholesterol levels but a number of the healthy controls had high levels. It will be of interest in a follow up study of the controls to determine whether or not those with higher cholesterol contents develop coronary heart disease sooner We did find however that the ratio of total cholesterol to phospholipids was much more significantly altered in the coronary patients than was the total cholesterol content alone This fact is in keeping with the finding of Dr. Barr and his colleagues at Cornell Medical School in a chemical study of the blood fractions in atherosclerotic patients of the higher than normal ratio of beta lipoprotein which contains a larger amount of cholesterol in relation to phospholipids, to alpha lipoprotein which contains much less cholesterol in relation to phospholipids. Two other researches of current interest should be mentioned here the further details and significance of which need more exploration. One has been the finding by Dr. Gofman and his associates of the presence of appreciable amounts of a light molecule of cholesterol protein floated at a so-called  $S_{10}$  level by the use of the ultracentrifuge in a much larger number of patients after acute myocardial infarction than of normal controls, e. g., 95 percent in men and 100 percent in

women as compared to 60 and 45 percent respectively between the ages of 40 and 50 years. Whether the controls showing this type of cholesterol molecule are more likely than others to develop coronary occlusion remains to be determined.

Extensive studies are now being initiated in three other research centers in the United States to help amplify the California investigation and to include patients with diabetes mellitus and with hypertension. The other research referred to has been conducted by Dr Sims of Columbia University. He has tested the amount of "lipofanogens" (precursors of visible fat) and of an inhibiting enzyme called "antilipfanogen" in the blood of normal and diseased persons by determining the amount of fat taken up from the blood by tissue cultures. He has found that the ratio of antilipfanogen to lipfanogen which is 1:1 in normal persons is much reduced in patients with nephrosis and diabetes and moderately reduced in those with coronary heart disease. A comparison of the findings in patients with coronary heart disease with those in controls using these three different techniques (physical chemical, and by tissue culture) has been planned. What will come from all this we have as yet no definite idea but clearly research as to the blood and tissue content of the lipids and lipoproteins, their metabolism, and their relation to ingested food elements and to the deposition of cholesterol in and fibrosis and calcification of the coronary artery wall is of great importance. A corollary of all this is investigation of conditions of the artery wall itself which may predispose to the superimposition of these changes. Do factors of stress, trauma, and nutrition, through the vaso vasorum or otherwise play a predisposing role? If so, how much and what?

*Hereditry*—In our series, and in others too, heredity has been found to be a significant factor apparently at least in part through the inheritance of body build and metabolic influence. In 27 percent of our 100 young patients there was a history of coronary heart disease in either one of (24) or both (3) parents (23 fathers and 4 mothers) in contrast to 14 percent (16 fathers and 5 mothers) in the 146 controls.

*Other findings*—Habits of work, exercise, nervous strain, diet and the use of tobacco and alcohol seemed to have little etiologic significance although excess of some of these factors may precipitate or aggravate symptoms of disease already present. As a matter of fact our coronary patients had ingested somewhat less cholesterol in their habitual diet than had the controls. The blood content of uric acid was, however, of some interest being distinctly although not greatly higher in the coronary patient. The basal metabolic rate was on the low side partly but not wholly to be explained by body build. The thyroid gland itself in the coronary group gave a lower reading

(17 to 41 percent) than the usual normal in its radioactive iodine uptake, or about midway between normal (30 to 50 percent) and myxedema (8 to 28 percent) levels. Finally, an interesting incidental finding concerned the reducing power of the saliva which was found to be greatly increased in the coronary patients as compared with the controls the significance of this is not as yet understood.

Thus, the fatalistic attitude toward coronary heart disease in youth and middle age, and indeed in early old age, too, is being challenged. The few clues discovered to date are unexplained and some are not susceptible to control, but others which include cholesterol metabolism and perhaps diet, muscular metabolism, and exercise, and eventually possibly even the use of substances of prophylactic value may afford us means whereby we may delay the onset or slow the course of coronary heart disease in the civilized world of tomorrow

#### ADDITIONAL NOTE ON THE CURRENT MILITARY IMPORTANCE OF CORONARY HEART DISEASE

It is evident from the experience of trained observers in military service that coronary heart disease has become increasingly more important in military personnel during the past decade. Before the first World War, and for some time afterward coronary heart disease did not seem to be an important problem in military service, although quite likely it was occasionally overlooked. Electrocardiography was not then in any way a routine method of examination. During the second World War however the attention of the medical officers of the Armed Forces was directed to the occurrence of acute and chronic coronary heart disease in young and middle-aged men. Dr Yater for example collected postmortem data on 450 men from 18 to 39 years of age in the military service of the United States who succumbed to coronary heart disease.

At present with more careful exclusion of those candidates for the armed services who show any evidence of cardiovascular disease or of anxiety neurosis, there are fewer separations from the service for such conditions as congenital defects of the heart and blood vessels, rheumatic heart disease hypertension syphilitic aortitis, and neuro-circulatory asthenia although patients with these conditions may in frequently still be found in the service or develop rheumatic fever, et cetera while on active duty. Even rheumatic fever however should be better prevented and controlled than in the past.

Evidence of coronary heart disease, however may appear for the first time while the service man is on active duty. The strain of grueling combat physical overexertion, and intense cold, may precipitate evidence of coronary heart disease that has already been developing previously although it may be symptomless. In 1940 the



hospital admissions per 1,000 mean strength per year in the U. S. Army and Air Force of persons with heart disease caused by coronary athero-sclerosis were as shown in table 1.

TABLE 1.—Admissions per 1,000 mean strength by age groups

Age (years)	Ref.	Age (years)	Rate
Under 20	0	40 to 44	— 47
20 to 24	02	45 to 49	— 20
25 to 29	05	50 to 54	10.04
30 to 34	08	Over 54	10.00
35 to 39	24	Total admission rate	23

Statistics Division of the Office of the Surgeon General, Department of the Army.  
Rate based on less than 5 patients.

It behooves us, especially in view of the apparently progressive increase in the occurrence of coronary heart disease, to make more thorough and searching studies of the etiologic factors and possible prophylaxis in the young men of our country whether in military service or in civil life.



# The Neuropsychiatric Implications of Illiteracy<sup>1</sup>

WILLIAM A. HUNT *Commander MSC U S N R*

CECIL L. WITTON *Commander MC U S N R*

ILLITERACY, defined as the inability to read and write, constitutes a serious problem for the military services in any period of national mobilization. Under peacetime conditions the services ordinarily avoid this problem by the imposition of educational requirements at the recruiting station level. With a national emergency and total mobilization, however, manpower requirements have always dictated that the services accept recruits who show such educational disability. In modern technical warfare the inability to read and write becomes a serious handicap which must be overcome if the recruit is to operate efficiently within the military service. Since illiteracy is most commonly an educational defect attributable to educational and cultural handicaps, the obvious solution is to introduce an educational program designed to teach the recruit to read and write. This solution was adopted by both the Army and the Navy during the last war. Literacy training programs were instituted for all men who, though unable to read and write, were adjudged capable of learning. Unfortunately the solution is not as simple as it sounds. Although mainly attributable to educational and cultural handicaps, illiteracy has many and important neuropsychiatric implications. These stem from two sources: (1) illiteracy is often symptomatic of some underlying personality difficulty and (2) illiteracy operating as a handicap to adjustment may be a contributing factor in the development of personality disorders. This makes it necessary in any program involving the training of illiterates, to pay particular attention to the personality structures of the persons involved and to the possibility of concomitant neuropsychiatric problems.

<sup>1</sup>This study is part of a larger research project subsidized by the Office of Naval Research and being conducted by the authors at Northwestern University, Northwestern University, Evanston, Ill., Medical College of the University of Nebraska, Lincoln, Neb.

From the symptomatic approach illiteracy may be an indication of mental deficiency. The performance of the symbolic functions involved in reading and writing requires some minimal intelligence and if a person does not possess this, no amount of training or opportunity will make him literate. Various organic conditions may be responsible for inability to read and write. Illiteracy also may be indicative of psychopathic personality. Occasionally an asocial psychopath resists the educational discipline of school as a part of his general rebellion against society. We have also found a few inadequate personalities among the illiterate group. Emotional instability as well, can contribute to illiteracy as can the general withdrawal or schizoid pattern of behavior which may lead a child to an educational backwardness often confused with mental deficiency.

On the etiologic side, the inability to read and write imposes a serious handicap on the person's ability to adapt to the demands of contemporary social living. Illiteracy becomes a source of insecurity, anxiety and increasing social isolation. Particularly in the military services, it may lead to disciplinary difficulties resulting from ignorance of posted orders. It also leads to unfortunate compensatory trends as a person tries to overcome the emotional problems involved. All these considerations stress the necessity of a neuropsychiatric supplementation to the simple educational approach if we are to have an adequate handling of the illiteracy problem.

In this article the relative incidence of neuropsychiatric disability in a typical group of illiterates is discussed. Are personality difficulties really more numerous in such a group than they are among literates? Is there a higher neuropsychiatric attrition rate during military service? The answer bears directly on the military efficiency of the illiterate recruit and on such complex actuarial questions as whether or not it is worth while for the military services to induct illiterate recruits and spend time, money and effort on their training. Since the recruits inducted in wartime furnish a fairly representative sample of the population, we believe that our findings have implications beyond the narrow military situation for the further understanding of the general problem of literacy. Two groups of illiterates were studied, one of 910 and one of 473. Both groups were selected at random from muster lists of illiterate recruits arriving at a naval installation for literacy training. The health record of each man was then obtained and abstracted. From this we ascertained the number of recruits discharged for neuropsychiatric reasons during their literacy training and the subsequent neuropsychiatric attrition rate of the remainder for about 1 year of service.

It must be remembered that from the neuropsychiatric point of view these were selected groups. As was customary at this time

these men were forwarded from recruit training centers where their illiteracy originally had been detected and where they had previously received a neuropsychiatric screening examination in order that they might be judged able to benefit from literacy training. This preliminary screening must have removed many neuropsychiatric cases.

Despite this preliminary screening, of the first sampling of 940 such recruits, 102, or 11 percent, were separated from the service for neuropsychiatric reasons during their literacy training. This is in contrast to an average screening rate at this period for all incoming recruits at naval training centers of from 3 to 4 percent. If we remember that many of the illiterates must have been screened out before being sent for literacy training it would seem conservative to estimate the incidence of established neuropsychiatric conditions in the original group as at least 15 percent or about 4 times that for the recruits as a whole.

Of those separated 97 were given inaptitude discharges for the reasons shown in table 1. Of the 5 who were given medical surveys, 2 were for constitutional psychopathic state, inadequate personality, 1 was for personality disorder, 1 was for enuresis, and 1 was for dementia praecox. Over one quarter of the men separated during training were discharged as morons although they had previously been screened at recruit training centers and adjudged to be capable of learning to read and write. Another quarter were called "unable to learn," a diagnosis used to avoid the stigma of mental deficiency and frequently employed where mental deficiency was suspected but where a clear diagnosis could not be made. These results point up the difficulty of a differential diagnosis of mental deficiency as opposed to simple illiteracy. Some of this may be attributable to the professional inexperience of those psychiatrists unacquainted with the problem who may assume that the two conditions are necessary corollaries of each other. This same difficulty in diagnosis is brought out in some of our other studies in psychiatric attrition during military service. We not infrequently find a recruit discharged from the Navy with a diagnosis of mental deficiency although our records show that he received adequate and valid psychologic testing during the training period and was adjudged to be of low normal intelligence at that time although suffering from a literacy handicap. In such cases the erroneous diagnosis is based on the assumption that illiteracy *always* is indicative of mental deficiency. The remaining 47 percent illustrate our point that illiteracy may also be a corollary of personality disorder although they furnish no evidence as to whether or not the educational difficulties were precipitated by the personality maladjustment or whether they were influential in precipitating the personality disorder. It is highly probable that both interpretations

are correct and that in most of these cases we are getting a mutually reinforcing reaction between the personality difficulty and the educational handicap.

TABLE 1—Reasons for inaptitude discharges of illiterate recruits

Reason	Number	Reason	Number
Mental deficiency moron	26	Sorinambullism	3
Inability to learn	23	Convulsions	1
Inadequate personality	16	Schizoid personality	1
Functional somatic complaints	10	Diagnosis questionable	3
Enuretics	9		
Emotional instability	2	Total	97

In about 1 year of active service following the literacy training period, 28 men or 3 percent of the group were discharged for neuropsychiatric reasons. The rate for the Navy as a whole in this period was 1.6 percent. Thus even after literacy training and multiple and careful neuropsychiatric screening these illiterate recruits are a poorer neuropsychiatric risk than are their literate companions. The diagnoses of these 28 men are shown in table 2. About one-third of these were classed as mentally deficient although they had escaped this diagnosis during training. The remaining 20 illustrate the relation between illiteracy and the various personality disorders. Because these disorders were not detected during training they may well represent persons in whom an illiteracy handicap contributed to the development of personality maladjustments.

TABLE 2—Diagnoses of illiterate discharged for neuropsychiatric reasons

Diagnosis	Number	Diagnosis	Number
Personality disorder	9	Enuresis	1
Mental deficiency moron	8	Constitutional psychopathic state	1
Psychoneurosis, anxiety	2	Emotional instability	1
Schizophrenia	2	Temperamental unsuitability	1
Epilepsy	2		
Speech disorder	1	Total	28
Sorinambullism	1		

We also investigated the disciplinary discharges among this group. Lumping together as "bad" all discharges labeled bad conduct "undesirable," or "dishonorable" we found that the disciplinary discharge rate was 1 percent for the year of the study. This is at the high end of the distribution for other recruit samples studied by us but is not sufficiently larger to be significant. To make certain that

HURT W. A., WITTEBY C. L., and BURTON H. W. A validation study of naval neuropsychiatric screens. *J. Consult. Psychol.* 4: 23-28, Feb. 1956.

HURT W., WITTEBY C. L., and BURTON H. W. A further validation of naval neuropsychiatric screening. *J. Naval Medical Inst.* In press.

the original sample of 940 illiterates studied by us was representative and that the figures derived from it were valid, we selected another group of 478 illiterates for the same treatment. The discharge rates in this second group were similar to those in the first and indicate that our samples were stable and adequate. In this second group 14 per cent were separated for neuropsychiatric reasons during literacy training 3.4 percent subsequently received neuropsychiatric discharges in the following year of service, and 0.7 percent received disciplinary discharges in that year.

Our findings indicated that, as a group, the illiterates are a greater neuropsychiatric risk in the military services than are literates. It would appear that of every group of 100 illiterates inducted for military service about 15 will be given neuropsychiatric discharges before their literacy-training program is completed and 3 more will be neuropsychiatric casualties by the end of the first year of service. It is impossible to unravel the actual cost of this high neuropsychiatric rate to the Government.<sup>8</sup> The cost is high but whether or not it is compensated for by the service rendered by the 82 still surviving after 1 year is an open question. It would appear however that as a group illiterates are not preferred material for military service and should be inducted only when a manpower shortage exists.

#### SUMMARY

Our study indicates that there is a much higher incidence of neuropsychiatric disorders among the illiterates than among comparable literate groups. Illiteracy is often diagnostic not only of mental deficiency, but of the various personality disorders as well. Moreover illiteracy would seem to add to the stress of personal adjustment and as an added handicap would appear to predispose the illiterate to personality difficulties. In handling the problem of illiteracy through any special training program, therefore, it would seem advisable to provide intensive psychiatric service both diagnostically and therapeutically, since the handicap offers more than a simple educational problem.



# Recent Advances in Military Ophthalmology<sup>1</sup>

VICTOR A. BYRNES, Colonel U S A F (MO)

THIS article will attempt to cover some of the more important recent advances in those phases of ophthalmology which have a direct bearing on the efficiency of the military services.

## EFFECTS OF SERVICE ENVIRONMENT ON THE EYES

*The solar spectrum and the use of ophthalmic filters.*—Each of the services has sunglass requirements. It has been recommended that the Armed Forces standardize a neutral gray lens of 15 percent transmission for normal sunglass use with special lenses to be obtained for special purposes. Transmission of 15 percent was selected after it was shown that this level gives satisfactory visual acuity and at the same time affords adequate brightness protection under most sun light conditions. It also preserves subsequent night vision adequately except under conditions of extreme brightness such as snow and beach exposures. When the protection of subsequent night vision is important under such conditions, special lenses will be required. For travel on snow into the sun for example, lenses with transmissions as low as 3 or 4 percent may be required.<sup>2</sup>

The neutral density gray lens which transmits a nearly uniform percent of visible light rays of various wavelengths was selected because it was shown that colored lenses do impair color perception to some extent<sup>3-5</sup> in spite of the fact that color adaptation occurs. The

<sup>1</sup> Presented at the Meeting of the Pan-American Congress of Ophthalmology and the National Society for the Prevention of Blindness, Miami, Fla., 29 Mar. 1950.

<sup>2</sup> U. S. A. F. School of Aviation Medicine, Randolph Field, Tex.

<sup>3</sup> FARRER H. H. Investigation of protection afforded by standard issue Army and Navy sun lenses and goggles from solar radiations present in Arctic. Tech. Force Sixty Eight, Operation X book. Research Report X 135 (A-382-e) 6 Jan. 1947.

<sup>4</sup> FARNSWORTH D. Effect of colored lenses upon color discrimination. U. S. Naval Submarine Base, New London, Conn. Color Vision Report 9 3 Sept. 1945.

<sup>5</sup> ROSE H. W. and SCHMIDT L. Physiological effects of reflective colored, and polarizing ophthalmic filters. USAF School of Aviation Medicine, Randolph Field, Tex. Project 71 07-040 Report 1 and (in press).

<sup>6</sup> SCHMIDT L. H. Method for calculating effect of filters on color vision. Medical Research Laboratory U. S. Naval Submarine Base, New London, Conn. Report 148 13 Sept. 1949.

<sup>7</sup> BYRNES V. A. Influence of sunglasses on object color perception. Office of Naval Research, Philadelphia, Pa. U. S. Navy Project NR 14L-563, 16 Sept. 1949.



ultraviolet rays are excluded by the glass of the lenses and the infra red transmission is low enough to be acceptable. The inconel coating used for top-grading of lenses has been found to be susceptible to abrasion, but is otherwise acceptable for special purposes. Top-graded lenses can be used for sun scanning for short periods of time.

The usefulness of ophthalmic filters in penetrating haze has been repeatedly studied but no filter has been found that will increase the accuracy of riflemen and most filters decrease it.

*Use of the eyes in dim light*—Instrument lighting is a problem aboard ships and submarines, in tanks, and aboard aircraft. When protection of night vision is necessary it has long been known that red light is best because it has no influence on the retinal rods. It has been shown that ability to read instruments is not significantly affected by the wavelength of the light used, so red light is not contraindicated from that standpoint.<sup>10</sup> In the completely dark adapted eye the critical intensity of illumination is about 0.92 foot lambert.<sup>11</sup> With the recent development of a satisfactory red illumination system for Air Force and Navy aircraft, red lighting will now be used by the Armed Forces for illumination of instruments when preservation of night vision is important.<sup>12-14</sup>

The use of binoculars at night has been extensively studied.<sup>15</sup> In general they are not satisfactory for scanning but are useful in examining specific areas because of the magnification they produce. Four to six-power binoculars are about as high a magnification as should be used. The focus of binoculars at night is usually 0.5 to 0.75 diopter more minus than in daylight vision. The pupil is dilated and this accentuates the aberrations of the optical system.

ROBERT, R. A. Tests of graded density sunglasses, Types A and B. USAF School of Aviation Medicine, Randolph Field, Tex. Project 35. 27 J. A. 1945.

STUMP, R., and PETERSON, E. A. Durability of metallic coating on graded density sunglasses. Air Materiel Command, Wright Patterson Air Force Base, Dayton, Ohio. Serial WPAALSC-425-47. 12 Jan. 1945.

FRANK, R. D. R., and ROCH, M. L. Dial reading performance related to illumination variables. Air Materiel Command, Wright Patterson Air Force Base, Dayton, Ohio. Report MCREXD-494-21A. 1 Dec. 1945.

FRANK, R. D. R., and ROCH, M. L. Dial reading performance as related to illumination variables. Air Materiel Command, Wright Patterson Air Force Base, Dayton, Ohio. Report MCREXD-494-21. 1 Oct. 1945.

BARON, F. R., and POPPER, J. R. Visual problems in devising improved indirect lighting for aircraft cockpits. J. Aviation Med. (in press).

ROBERTS, L. B. Interior lighting of M-4 tanks. Armored Medical Research Laboratory Ft. Knox, Ky. Project 7-2 and 7-3. 25 Feb. 1942.

ROBERTS, L. B., and MAX, W. E. Establishment of criteria and methods for selection of crews for night operations. Armored Medical Research Laboratory Ft. Knox, Ky. Project 7-4 and 7-8. May 1942.

BRACKETT, F. R., ROBERTS, L. B., and MAX, W. E. Advantages of using binoculars for night seeing. Armored Medical Research Laboratory Ft. Knox, Ky. Project 6-1. 1 May 1942.

WILCOX, G., and GILBERT, I. R. Change in refractive power of human eye in dim and bright light. J. Optic. Soc. America 37: 321-324, May 1947.

Probably about 0.25 diopter of the "night myopia" is caused by spherical aberration, 0.5 diopter by chromatic aberration and any balance by involuntary accommodation. This "night myopia" does not apply above cone levels of illumination. For this reason the suggestion sometimes made that spectacles for night driving be made 0.5 diopter more minus than the regular distance correction is not justified. The "night myopia" only occurs in average persons while rod vision is being used when the light is below the brightness of moonlight.

Although nonreflecting surface coating of lenses in optical instruments has been shown to be valuable the surface coating of transparent aircraft panels has not.<sup>7</sup> Such surface coating does not increase light transmission enough to cause appreciable change in brightness. The ability of such coating to decrease specular reflection is useful, but shielding the instrument lighting will produce the same effect. The coating itself if used, may produce a slight haze but this is insufficient to be of serious import in night vision.

*Vibration effects*—All types of motor propelled craft produce vibrations that may be transmitted to the instrument panel of the tank, ship, or plane. Some of these craft in addition produce vibrations that may be transmitted to the eye. The eye has a tendency to vibrate at its own frequency which is about 40 cycles per second. This may be induced at high frequencies but is more likely to be produced by low frequencies, especially 10 to 40 or 60 to 90 cycles per second.<sup>8</sup> No specific damaging effects of ultrasonic vibration on the eyes are produced by current aircraft of any type nor are they expected in aircraft of the near future. Lethal effects produced in fur bearing animals by such vibrations are thermal in nature and are caused by conversion of acoustic energy to heat by the fur. This does not occur in man because of lack of fur, higher heat tolerance and a more efficient heat dissipation mechanism. The vibration of the instrument panels is very fatiguing to the observer. Vision is maximally altered by vibrations of from 25 to 90 and altered little by vibrations over 100 cycles per second. Low intensity illumination or the use of small print increases the difficulty of reading under conditions of vibration.<sup>9</sup> The minimal threshold for perception of vibration has been shown to

CHAPIN, A. and SCHUTTER, B. Visual effectiveness of low reflectance coatings applied to transparent areas of aircraft. Air Materiel Command, Aero Medical Laboratory Wright Patterson Air Force Base Dayton, Ohio. TMAL-003-02, 21 Oct. 1945.

\* DE CRET, J. and M. CRET, A. Physiopathologie Oculaire de l'Aviateur. Publication Societe d'Ophthalmologie de Paris, Nov. 1947.

\* CHODURA, M. and H. O. S. and H. W. V. A. C. Studies of effect of typographical spacing on legibility of numerals under vibration. Air Materiel Command, Aero Medical Laboratory Wright Patterson Air Force Base Dayton, Ohio. MCREXO-694-1 Q, 23 Dec. 1948.

be about 0.0005-inch double amplitude at a viewing distance of 14 inches.<sup>20</sup>

*High altitude*—Flight at high altitudes produces effects caused by decreased oxygen tension, decreased barometric pressure, increased brightness of sunlight and decreased sky brightness. The hypoxia causes (1) cyanosis of the retinal vessels, (2) increased diameter of the retinal vessels with consequent increased volume, (3) intra-arterial tension proportional to the rise in the general circulation, (4) increased intraocular tension which parallels the vascular changes, (5) papillary constriction caused by increased metabolites and inhibition of the constrictor (6) decreased accommodation, and (7) decreased night vision.<sup>21</sup> All these effects can be reversed by the administration of oxygen alone without changes in the barometric pressure. These changes are important when air evacuation of patients with eye injuries or eye diseases is considered. The recent development of laboratory techniques for determining the effect of hypoxia on the retina and visual pathways has shown that the cortex is affected first by oxygen lack and that the retina can be stimulated about twice as long as the cortex with complete oxygen deprivation.<sup>22</sup> Techniques developed in this study are now being used to evaluate the beneficial or toxic effect of drugs on the visual pathways.<sup>23</sup>

The decreased barometric pressure may produce bubbles (dysbarism, "bends") that may pass into the cerebral circulation. These bubbles may produce a vascular spasm with scintillating scotomas and visual field changes. The electroencephalogram is altered showing a decreased frequency of the alpha waves. It returns to normal as the scotomas disappear and the headache caused by vasodilatation appears. There may be accompanying profuse and generalized symptoms. Retinal vasoconstriction and visual field changes are important diagnostic criteria for cerebral vasospasm produced by "bends." These latter visual changes are frequently a recompression phenomenon coming on as the subject approaches the ground. This is presumably caused by reduction in the size of the intravascular bubbles, permitting them to reach the cerebral circulation. Pressurized cabin air raft permit flights at high altitudes with almost none of these conditions occurring.

1. MORGAN, M. H. and HERR, O. R. and HERR, A. C. Determination of suprathresholds for visual perception of vibration. Al M (Arl) Command, Aero Medical Laboratory Wright Patterson Air Force Base Dayton, Ohio. Memo Report MCREX 4941 R. 1 Feb 19.
2. WATSON, W. and HERR, O. R. Effect of hypoxia on retina and optic pathways. USAF School of Aviation Medicine Randolph Field Tex. Project 21-47 111 (1 press).
3. WATSON, W. and HERR, O. R. Method for evaluating toxic or beneficial effect of drugs on visual pathways. USAF School of Aviation Medicine Randolph Field, Tex. Personnel communication Jan 20.

Incident illumination from the sun exceeds 12,000 foot-candles at 40,000 feet.<sup>22</sup> The newly standardized sunglasses previously mentioned will give adequate protection both as to brightness and abiotic rays at our highest present operational altitudes. The sky brightness at high altitudes is reduced to about 25 percent of that at ground level because of lowered concentration of light reflecting particles of dust and moisture. Problems of visibility are, therefore, changed. Other aircraft are most apt to be seen as bright spots on a dark background, rather than the reverse as seen at ground level. This decreased sky brightness also produces visibility problems inside aircraft because of the small amount of light reflected into the cockpit from the darker sky. This may vary from 0.12 to 6,000 foot-candles at one aircraft position depending on the direction of its flight in relation to the position of the sun.

*Acceleration forces.*—Angular accelerations occur in aerial movements such as a pull-out from a dive or in a turn. In a pull-out from a dive the flyer is forced down into his seat and may experience a force on the seat equivalent to many times his real weight. If this force is equivalent to four times his body weight, it is referred to as 4 g, or four times the pull of gravity. In straight and level flight there is a force of 1 g on the seat. Higher g forces produce their stresses throughout all the body tissues. At 6 g for example, the blood has the weight of molten iron. Pull-out from a dive produces positive g (head-to-seat force). In an outside loop negative g (seat-to-head force) is produced. Physiologic effects are complex and are not primarily ophthalmologic in nature but the symptoms that temporarily incapacitate the flyer are ophthalmologic.

In head-to-seat forces the blood is forced away from the head. When the systolic pressure falls below 20 mm. of mercury the retina becomes ischemic because the intraocular pressure now exceeds the vascular pressure. This ischemia produces a reduction first in the nasal field which then spreads entirely across the visual field until central vision is lost. The onset of this "graving out" can be noted by the average observer at 3 to 4 g.<sup>23</sup> He "blacks out" on the average at 4 to 5 g. Anything which can be done to raise the vascular pressure in his eyes will increase his g tolerance. This can be done by suit exerting pressure on his legs and abdomen to reduce pooling of blood. It can also be done by shortening the heart-to-eye level by

<sup>22</sup> C. H. STICKNEY, J. M. Some typical sky and earth brightnesses at altitudes 10,000 to 40,000 feet and relationship to eye-adaptation problems of radar operator. *AI Materiel Command, 1 to Medical Laboratory Wright Patterson Air Force Base Dayton, Ohio, TRFAL-634* 11 Dec 1949.

<sup>23</sup> M. TINKER, J. L. Some considerations in selection of flying sunglasses. *J Aviation Med.* 30: 10-16 Feb. 1949.

<sup>24</sup> Synopsis of the medical aspect of jet-propelled aircraft. *AI Materiel Command, Wright Patterson Air Force Base, Dayton, Ohio. Unnumbered report, 4 Mar 1949.*



to the fixation light, large visual stimuli are present, neither of these phenomena occur. They are important in flying because they can cause flyers to become badly disoriented and to crash before they have time to recover.

*Markings on aircraft and runways to increase visibility*—The necessity for locating aircraft in flight and on the ground following emergency landings has led to continued search for the most suitable markings. If standard aluminum aircraft are used, they can be located best in flight if the trailing halves of their wing and empennage surfaces are painted glossy sea blue.<sup>24</sup> If operating in arctic regions they can be located best on the ground if insignia orange paint is used on the aluminum aircraft.<sup>25</sup> It should be applied in a solid color over the entire posterior portion of the airplane from the center of the wing to the end of the rudder. By this use of color with the aluminum airplane, both chromatic and achromatic contrasts are provided. Runway markings to give the best visual orientation for the pilot coming out of a low overcast have been found to be chevrons of either black on yellow or yellow on black. The chevrons give information as to the portion of the runway which is visible and the direction in which the runway extends.<sup>26</sup> Such markings give the necessary final visual aid to aircraft landing under low ceilings.

#### VISUAL STANDARDS AND EYE EXAMINATIONS

Each service is attempting to analyze the visual requirement for each of its jobs.<sup>27</sup> They are trying to set up standards to procure personnel with the visual skills required for these jobs. Finally they are attempting to standardize examining techniques that can be administered as accurately and as rapidly as possible by nonophthalmologists.

*Color vision*—Color saturation thresholds can now be accurately measured and should give better information regarding the effects of various environmental factors on color perception.<sup>28</sup> Pseudo-

<sup>24</sup> WAGNER, H. G. and BLASDEL, L. C. Visibility studies of exterior schemes of aircraft to present aluminum color. Aero Medical Equipment Laboratory Naval Air Materiel Center Philadelphia, Pa. TEDNAM-AE-525044, 18 May 1940.

<sup>25</sup> WILSON, L. B. and GRIFFIN, W. F. Color markings of aircraft operating in Arctic regions. Air Materiel Command, Aero Medical Laboratory Wright Patterson Air Force Base Dayton, Ohio. Report AF TR-5814, May 1940.

<sup>26</sup> GIBBONS, R. and HENKEL, H. Study of runway markings and identification lighting systems. USAF School of Aviation Medicine Randolph Field, Tex. Project 21-02-007 Apr 1940.

<sup>27</sup> DICKERT, F. B. Vision in the determination of visual requirements for various tasks in armored vehicles. Armored Medical Research Laboratory Ft. Knox, Ky. Projects 6-1-6-1 and 6-4-23 Jan. 1943.

<sup>28</sup> SCHMIDT, I. and BILLY, A. Effects of oxygen deficiency and various other factors on color saturation thresholds. USAF School of Aviation Medicine, Randolph Field, Tex. Project 1-02-041 (to be published).

isochromatic plates are still the best single screening test for color defectiveness.<sup>23-25</sup> Anyone who can honestly pass a properly administered pseudo-isochromatic plate test can perform any color discrimination task required by the Armed Forces. Illumination has been shown to be such a critical item in giving these tests that artificial light of proper daylight color temperature should be used in preference to natural daylight.<sup>26-28</sup> Not only light of low color temperature but also light of high color temperature (analogous to a north sky) may produce unreliable results.<sup>29</sup>

All the Armed Forces are interested in the use of the 9 percent of men with defective color vision. The best way to determine whether a mildly color-defective man can do any particular color vision task is to use a test which simulates it.<sup>30</sup> If certain lights are to be identified, lights of the same intensity, color and subtended visual angle must be used in the test.<sup>31-33</sup> The loss of brightness experienced by color-defective men has not been adequately appreciated until recently. Deuteranopes lose about 40 percent of the brightness of their fields and protanopes lose about 50 percent. This point may be important in selecting personnel for specific low illumination jobs.

*Visual acuity*—The importance of visual acuity has been amply demonstrated in connection with many service tasks. One of the interesting studies in this respect was the demonstration of its relationship to success in combat flying. It was the visual factor which seemed to have the highest correlation with success in aerial combat.<sup>34</sup> Most of the service visual tasks have been assessed and the specific requirements established for visual acuity in those positions.

<sup>23</sup> FARNWORTH, D., STERLING, H. G. and RUSSELL, P. F. Battery of new fall tests for detection degree of color deficiency. Medical Research Laboratory, U. S. Naval Submarine Base, New London, Conn. Report 147, 1 Aug. 1949.

<sup>24</sup> RUSSELL, P. F. New test for examination and training of color vision. USAF School of Aviation Medicine, Randolph Field, Tex. Project 21, 2-544 Report 2 (in press).

<sup>25</sup> FARNWORTH, D. and ELLIS, J. D. Effect of certain illuminations on scores made on pseudo-isochromatic plates. Color Vision Report 4, U. S. Naval Submarine Base, New London, Conn. 1 Dec. 1943.

<sup>26</sup> HALL, L. H., RUSSELL, P. F. and RITTEN, M. C. Effect of quality of illumination on results of Ishihara test. J. Opt. Soc. America 34, 94-94, Feb. 1944.

<sup>27</sup> RUSSELL, P. F. Further study of effect of illumination on interpretation of pseudo-isochromatic plates. USAF School of Aviation Medicine, Randolph Field, Tex. (unpublished report Jan. 1950).

<sup>28</sup> RUTHER, W. F., CONNELL, R. C. and BUNG STAB, J. M. E. personnel evaluation test of the New London Naval Laboratory for testing color perception. AFM (Naval Command, Aero Medical Laboratory Wright Patterson Air Force Base Dayton, Ohio. MCHLXD-494 21 b, 1 Mar. 1949.

<sup>29</sup> RUSSELL, P. F. New test for examination and training of color vision. II Signal 1 rep. USAF School of Aviation Medicine, Randolph Field, Tex. Project No. 21-52-543 (in press).

<sup>30</sup> LEE, L. L. and WOLLASTON, L. Comparison of tests for predicted color deficiency. J. Opt. Soc. Med. 19, 7, Jan. 1944.

<sup>31</sup> LEE, L. L. The loss of brightness in testing for flying. USAF School of Aviation Medicine and Research, Pensacola, Fla. Project XIRG (A 213-b, 1 June 1947).

The checkerboard type of target probably represents the best test of pure resolution, while the letter chart is as satisfactory for practical visual acuity testing purposes as any other.\* New visual-acuity test charts have been designed for testing both at 20 feet and at 14 inches. Projection types of visual acuity charts should not be used when accurate testing is desired.

The "Manual of Instructions for Testing Visual Acuity"† prescribes a brightness of from 10 to 15 foot lamberts on the chart itself with the room walls painted a gray of from 35 to 50 (preferably 40) percent reflectance. The method of uniform illumination of the room and the exact technique of giving the test are described in the manual. The candidate is given credit for any line on which he correctly reads 7 of 10 letters. He is given no credit for lines on which he reads less than 7 letters correctly.

Other recent developments in visual acuity testing are the so-called "machine tests" using the Bausch and Lomb orthorater and the American optical sight screener. These tests are being administered by a group of nonmedical Air Force officers to see what results can be achieved in a screening test by a nonprofessional group in such a program. This may be of great value in view of the shortage of medical officers in the service. This testing program includes near and far visual acuity, near and far heterophoria, and depth perception. When administered by trained people these machine tests are as reliable as clinical tests.‡ In addition they can be moved more readily and can be administered faster than clinical tests. When tests are to be given at several localities as by a traveling examining board, more constant test conditions are assured through the use of machine tests, and they require much less space for administration than is necessary for regular clinical tests.

*Heterophoria*—No correlation has as yet been shown between extraocular muscle balance and success or failure in military visual tasks. Adequate muscle balance is required for many such tasks but the determination of exact boundaries within which a person will be satisfactory and outside of which he will be unsatisfactory has not been accomplished. Most tests of heterophoria are reliable tests of the particular aspect of heterophoria which they test but the different tests do not correlate well with each other. This is probably because no two of them test exactly the same function. The "Manual of In

\* Studies in Visual Acuity. Personnel Research and Procedures Branch, Adjutant General, U. S. Army, Washington, D. C. Research Program PR 4075, Aug. 1947.

† Army Navy Research Council Vision Committee, 1 Oct. 1947.

‡ James H. A. Comparison of orthorater with Balcal ophthalmological examinations. U. S. Naval School of Aviation Medicine and Research, Pensacola, Fla. Project X-499 (A 703-p) Report No. 1, 1 Mar. 1948.



structions for Testing Heterophoria and Prism Divergence at Near"<sup>18</sup> prescribes a technique to insure consistent results between the military services.

*Night vision*.—At present emphasis is being placed on training in night vision because the average American has only a rudimentary idea of how to use his eyes at night. The night-blind person can be detected in a properly administered night vision training program. Night vision testing is limited for the most part to detection of the night blind. Accurate testing to discover persons with superior night vision are so time consuming that they can be used only for selection for some special purpose.

*Depth perception*.—The ability to perceive depth is important in many military occupations and especially in flying. The exact mechanism by which depth is determined varies under different circumstances and according to various observers.<sup>19</sup> An apparatus to measure the ability of persons to determine depth by use of the factor of motion parallax has recently been developed.<sup>20</sup> Results obtained on this test correlate better with flying ability than tests used previously.

#### INDUSTRIAL EYE CARE IN THE ARMED FORCES

All the Armed Forces now have large industrial organizations so industrial eye-protection programs are required. The Navy has recently reported outstanding results in several of its plants.<sup>21</sup> In one plant prior to starting the program in 1946, there were 38 eye injuries per million man-hours with a total of 50 injuries. Ten months later there were no injuries in over 2 million man-hours worked in a similar period. This is a record of which the Navy can be justly proud.

#### ACRYLIC PROSTHESES FOLLOWING EYE ENUCLEATION

All the Armed Forces now use plastic eye prostheses. They were first developed and used at Valley Forge General Hospital in the fall of 1944.<sup>22</sup> Since then that hospital has made 3,400 prostheses and 2,500 conformers. The advantages of plastic over glass eyes are (1) they are not subject to erosion by the orbital secretions and therefore do not irritate the palpebral conjunctiva nor become too rough to wear (2) they appear more lifelike (3) they have better motility

<sup>18</sup> N. National Research Council Vision Committee, 1 Oct. 1947.

<sup>19</sup> W. and F. W. Frazer, Distance discrimination. Air Medical Command, Army Medical Laboratory, Wright Patterson Air Force Base, Dayton, Ohio. Report M(RED) CM 97 b 6 Jul 1944.

<sup>20</sup> How, H. W. Motion parallax factor of depth perception. USAF School of Aviation Medicine, Randolph Field, Tex. Project 21-02-479 (in press).

<sup>21</sup> W. C. High Rights of Sea eye protection, eye-correction program. Ty. Am. Armed. 1944. (in press).

<sup>22</sup> W. T. Personal communication, Mar. 1950.

(4) they are much better in cold weather because they do not feel cold to the patient do not fog and they do not cause a loss of much body heat (5) the colors are permanent as they do not fade or darken (6) they give the patient a feeling of security because they do not break when dropped and (7) they can be adjusted or reconstructed after being worn for some time

The less the prosthesis is removed, the less secretion and irritation is produced. These prostheses may be left in the socket from a week to a month without producing a fetid odor or appreciable secretion. Orbital implants are important in getting good results after enucleations or eviscerations. The implants help maintain proper orbital and palpebral contour, prevent sagging of the upper lid, and aid in giving motility to the prosthesis. Of all the types of implants tried, the buried type of acrylic implant with tantalum mesh is the most satisfactory. The peg type is unsatisfactory because, although it gives wonderful motility, it is too easily extruded.





# The Eosinophil as an Aid in Clinical Diagnosis

JACQUES L. SHERMAN JR., Capt. U. S. Army

WITHIN recent years the clinician's attention has been directed to the eosinophil by the fact that (1) in both civilian and military medicine there has been an increase in the number of patients with "tropical" diseases, generally associated with eosinophilia, (2) there has been a revolutionary development in the appreciation of the role of the adrenal cortex in disease processes and of the relationship of this principle to the eosinophil and (3) simple, accurate methods for counting eosinophils, available to even the smallest laboratory, have been developed. Thus, knowledge about the eosinophil and the eosinophil response is becoming more valuable to the physician in his daily practice.

*The eosinophil* is a polymorphonuclear granulocyte of the same size as the neutrophil having a nucleus which is usually bilobed, slightly larger and less deeply stained than the nucleus of the neutrophil. The granules of the eosinophil are characteristic, being coarse, uniformly large and ovoid, and taking a deep red stain. These cells are less motile than neutrophils, but they show phagocytosis and chemotropism of the same order as neutrophils. They are known to contain iron, oxidase, peroxidase, and histamine. There has been much controversy about the origin of these cells, but it appears that they are formed in the marrow from eosinophilic myelocytes. Their function seems to be related to removal or detoxification of foreign material and it is believed that the eosinophil is a part of the body defenses against invasion by heterogenous proteins.

*Normal values*—In the peripheral blood of adults there are normally from 50 to 300 eosinophils per cu. mm., or from 0 to 5 percent on differential count. Normal ranges in children are from 50 to 700, averaging about 300 per cu. mm., or from 0 to 8 percent of the leuko-

cytes. For bone marrow the eosinophils range from 4.0 to 750 per cu. mm., or 0.5 to 4 percent.

*The total eosinophil count*—Direct chamber counting has many advantages over differential counting on stained smears. It is more accurate, more rapid, and gives information not available by other methods. Anyone who has made differential counts is aware of the significant variations in results possible when searching for eosinophils in different areas of the slide. Because eosinophils are relatively few in number, small errors are of significance in determining the total. Even with neutrophils and lymphocytes, which occur in much greater numbers, there is great variation in counts by different observers, or by the same observer in different areas of the smear. In order to obtain the total number of eosinophils, it is necessary to combine the results obtained from the differential count with the total leukocyte count, thus requiring two procedures, in each of which there is some inherent error. On the other hand, the direct eosinophil count requires only one operation and both the total eosinophil count and the total leukocyte count can be made from the same preparation, thus achieving rapidity and efficiency. Furthermore, when there is eosinopenia, only direct counts are of value in following the course of the cells.

As to the accuracy of the direct count, a careful statistical analysis is available which demonstrates that this method is consistently more accurate than a 200-cell differential count. Even greater accuracy is obtained by using the technic and criteria described below. We have found the results reproducible both on the same sample and by different observers. In routine ward work when a total leukocyte count is needed, this technic can be used inasmuch as it requires the same equipment. The advantage is that at the same time that the total leukocyte count is made, quick scanning of the chamber can be accomplished, and, if there appears to be an eosinopenia or eosinophilia, a direct count can be made. Using this technic, clinical entities may be discovered which otherwise might be unsuspected.

MARTINSON, R. O. R. RICHARDS, W. J. and LOW, G. L. Differential leukocyte count. *J. Path. & Bact.* 51: 237-38, Nov. 1940.

MARTINSON, R. O. W. Unavoidable error in differential count of leukocytes (blood). *J. Clin. Invest.* 12: 77-81, J. 1933.

RICHARDS, W. J. and MARTINSON, R. O. Comparison of differential counts from stained film and counting chamber using propylene glycol aqueous stain. *Am. J. Clin. Path. Tech.* 5: 7-22, Mar. 1943. Note: Comparison of counting chamber and stained film differential counts: further use of propylene glycol aqueous stain. *Proc. Central Soc. Clin. Laboratory* 44: 544.

As the 100 cells total count, each eosinophil in the chamber represents only 5.8 cells in the peripheral blood. Also on the differential smear, each eosinophil seen may represent from 40 to 160 cells in the circulatory blood.

*Technic of the direct eosinophil count*—Necessary materials include an ordinary white blood cell pipette, a standard counting chamber, and diluting fluid. Blood is drawn into the pipette to the mark 1 and the diluting fluid to the mark 11 making a dilution of 1:10. The mixture is shaken gently for 5 minutes. 2 drops are blown out and one side of the counting chamber is filled. The pipette is shaken again to insure good distribution of cells. 2 drops are blown out and the other side of the chamber is filled. The cells are allowed to settle for a few minutes before counting. Under ordinary substage illumination all of the leukocytes will be visible, the eosinophils appearing slightly pinker than the other cells or the background. Increasing the illumination by raising the substage condenser, opening the iris diaphragm wide and using a strong central light will obliterate all cells but the eosinophils.

All of the eosinophils in the entire ruled area of one chamber (9 sq. mm.) are counted, and this is repeated on the other side so that all 18 ruled squares are included. This can be done with the low power objective, and any questionable cells can be positively identified by switching to the high-dry objective. The total number of eosinophils per cu. mm. of blood is then calculated by the following formula:

$$\frac{\text{total number of cells counted}}{18} \times 100,$$

i. e., total for 18 squares divided by 18  $\times$  10 (correction for dilution)  $\times$  10 (correction for chamber depth). More simply the total number of cells counted multiplied by 5.5 will give the total number of eosinophils per cu. mm. of blood.

Special precautions must be taken to insure accuracy because there are relatively few eosinophils in the blood and small errors are greatly magnified in the end results. Exact dilution, proper shaking, correct filling of the chamber and careful counting must be observed. If the number of cells on one side varies from that of the other side by more than 10 percent it should be assumed that cell distribution is poor and another chamber should be filled and counted. The total leukocyte count can be obtained from the same preparation by simply reducing the amount of light entering the chamber from below. It must be remembered, however, that the dilution factor here is 1:10 and not 1:20 as in the ordinary leukocyte count.

*Diluting fluid*—There is, at present, no diluting fluid which is ideal in all respects, but there are several which are satisfactory for routine use. The diluents of one group are modifications of Dungen's original fluid, i. e., combinations of eosin, acetone, and water. The fluid used

by Thorn and coworkers is quite unstable and therefore is difficult to use in routine ward and laboratory work. We have used a diluent prepared at the Georgetown University Hospital and have found it to be satisfactory. It is made as follows.

Aqueous eosin, 1 percent	-----	10 cc.
Verobon	-----	25 cc.
Distilled water q. s. d.	-----	100 cc.

The only undesirable feature of this diluent is the fact that the leukocytes begin to swell and to rupture in from 30 to 60 min. after mixing. Thus difficulties arise in rechecking count in teaching in having other observers repeat the count in making several simultaneous counts, or in refilling another chamber if distribution was poor on the first. This fluid is unstable if kept at room temperature for more than 2 or 3 days, so it should be stored in a refrigerator.

The other type of diluent, described by Randolph<sup>28</sup> is a propylene glycol aqueous stain. This is stable at room temperatures for from 6 to 8 weeks and does not destroy leukocytes so that counts may be made at any time after filling the pipette. It has been the experience of some observers that the eosinophils do not stain very well, but with the optical method of reduction of unstained cells described above no difficulty has been noted in obtaining accurate and reproducible counts. This fluid is prepared by using

#### Ratio 1

0.1 percent methylene blue	1 propylene glycol	50 cc.
Distilled water	-----	50 cc.

#### Ratio 2

0.1 percent phloxine	1 propylene glycol	50 cc.
Distilled water	-----	50 cc.

Equal parts of solutions 1 and 2 are mixed in a test tube. This mixture remains stable for about 4 hours after which time there is some precipitation of dye.

Solution 2 may be used as a diluting fluid by itself, if simplicity is desired. This eliminates the necessity for preparing two solutions and for mixing them when counts are to be made. The disadvantages

FOUR P H THORN C W and PRATT F T G. Clinical studies with primary adrenocorticotropin. *J. The Endocrinol.* 15-60, Jan. 1941.

FOUR W FOUR AM I H PRATT F T G and H LA A G. Test for adrenal cortical insufficiency response to pituitary adrenocorticotrophic hormone. *J. A. M. A.* 117: 10-100, J. 7, 1940, correction 37: 1344, 1941.

LA C F. Personal communication.

RASTOPEL T G. Blood studies in Bery direct counting chamber determination of eosinophils by propylene glycol aqueous stain. *J. Allergy* 1: 60-64, M. 1944.

RASTOPEL T G. I. Kohn in use of examination of eosinophils in the count chamber with a 1:1 in suitable technique in pyrazine ACTH dosage. *J. Lab. & Clin. Med.* 34: 1096-1101, Dec. 1949.

are that staining of the eosinophils is not as good and that chamber differential leukocyte counts cannot be made. Personal experience indicates, however, that it is an adequate diluent for routine use. Henneman et al.<sup>1</sup> at the Army Medical Service Graduate School used this solution in their study of diluting fluids. They found Randolph's propylene-glycol phloxine stain more stable and reliable than the eosin acetone diluent used by Thorn.<sup>12</sup>

*Experimental studies on eosinophilia.*—Much experimental work has been done to explain the basic causes of eosinophil production. From this work several principles can be derived which help to explain the eosinophilia which is characteristic in certain diseases. Almost all true allergic conditions are associated with eosinophilia, and investigations into the antigen-antibody mechanism have demonstrated the relationship of this mechanism to eosinophil production. For example, it has been shown that although these cells have a definite chemotropism toward protein materials, there is no relationship between the degree of eosinophil response and the amount of material. Eosinophils show greater chemotropism *in vitro* toward split protein factors, such as Witte's peptone, than to keratins extracted from *Trichinella*,<sup>13</sup> but under conditions necessary for antigen-antibody response there is a definite production of eosinophils. Thus, a single injection of protein will cause eosinophilia only when the protein is antigenic and relatively insoluble so that the antigen remains in the body, and after sufficient time has elapsed for antibodies to have been formed.<sup>4</sup>

Another demonstration of the relationship of eosinophils to sensitization phenomena is by the production of a local and general eosinophilia following repeated injections at 3-day intervals of soluble protein into experimental animals. In this experiment it was seen that no eosinophil response followed the first injection, but that there was an increasing eosinophilia following each subsequent injection. This reaction could not be produced by injections of protein free material.<sup>14</sup> The experiments of Opie and Rous, cited by Kirk, also demonstrate the relation of protein to eosinophils. They showed

<sup>1</sup> HENNEMAN, P. H., WILKINSON, H., and WESTERN VER, M. M.: Comparison of eosin acetone and phloxine-propylene glycol diluents in eosinophil counts. *J. Lab. & Clin. Med.* 34: 1017-1020, July 1949.

<sup>2</sup> For discussion of the relative merits of these various diluents see R. ROUS, T. G. and R. LILLY, J. P.: Eosinophil observations I. drug-antitropic hormone (ACTH) therapy. *Proceedings of the First Clinical ACTH Conference*. The Blackiston Co., Philadelphia, Pa., 1950, pp. 1-13.

<sup>3</sup> I. GRANT, M. L. R., and WATSON, W. B.: Chemotropism of human eosinophilic polymorphonuclear leukocytes. *Arch. Path.* 24: 318-322, Sept. 1920.

<sup>4</sup> C. MCKELL, D. H. (Chicago): Experimental eosinophilia with keratin from *Acanthamoeba* and other sources. *J. Infect. Dis.* 71: 70-75, May 1941.

<sup>5</sup> H. and J. H. KIRK: Observations on eosinophilic cells. *J. Path. & Bact.* 33: 799-810, Sept. 1932.

<sup>6</sup> H. R. C.: Causes of eosinophilia. *Internat. Clin.* 1: 10-232, 31: 194...



that there were few eosinophils in the blood or lymph of starved animals, but that feeding with protein produced a great increase in the number of these cells in the thoracic duct and in the blood.

Noguchi, in 1912, first noted eosinophilia following splenectomy. The exact cause of this phenomenon is still being investigated, but it is suggested that it may be on the basis of a splenic hormone. Injection of a protein-free splenic extract will reduce the eosinophilia of splenectomized animals but will not affect the eosinophil level of normal animals. These studies may help to explain the basic causes of eosinophilia, common to allergic states, extensive skin lesions, parasitism, and certain types of poisoning. Abnormal or split proteins can be implicated in each of these conditions.

*The eosinophil response*—Hills et al.<sup>17</sup> showed that there is a characteristic fall in circulating eosinophils and lymphocytes following the injection of adrenocorticotrophic hormone (ACTH) in man. It was demonstrated that this response depends on a competent adrenal cortex and this principle is the basis for tests of adrenal function. The 4-hour ACTH test described by Thorn<sup>18</sup> is performed as follows: a total eosinophil count is made on the fasting patient who is then given 20 mg. of ACTH intramuscularly. Four hours later the total eosinophil count is repeated. A fall in circulating eosinophils of 50 percent or more is interpreted as indicating normal response of the patient's adrenal cortex.

A test based on the same response to ACTH may be performed with epinephrine. After determining the fasting total eosinophil count the patient is given 0.5 cc. of 1:1000 epinephrine subcutaneously. After 4 hours the eosinophil response is measured, and a fall of 50 percent or more indicates normal adrenal function. The response to this test depends on stimulation of the pituitary to produce ACTH and on the response of the adrenal cortex to this ACTH.<sup>19</sup> The eosinophil response must be interpreted as a measure of a nonspecific stress reaction of the intact organism. Eosinopenia of the type seen following ACTH or epinephrine administration is also noted after surgical operations,<sup>20</sup> electroshock therapy,<sup>21</sup> glucose adminis-

<sup>17</sup> HILLS, A. G., F. MURRAY, P. H., and FINCH, C. A. Changes in circulating leucocytes induced by the administration of pituitary adrenocorticotrophic hormone (ACTH) in man. *Blood* 3: 525-528 July 1948.

<sup>18</sup> ALBERT, T. P., LARSEN, J. H., and COHEN, E. J. Response of circulating eosinophils to epinephrine as an index of adrenal cortical function. *New York Med.* 14-19 June 1950.

<sup>19</sup> KUCHEL, M., ET AL. The levels of circulating eosinophils and their response to ACTH in surgery: their use as index of adrenal cortical function. *Proceedings of the First Clinical ACTH Conference*, The Elishaw Co., Philadelphia, Pa., 1950, pp. 55-63.

<sup>20</sup> THORN, C. W. Studies on pituitary-adrenal relationships. *Tr. Am. Clin. & Climatol. Assoc.* 69: 164-171 1945.

<sup>21</sup> ALBERT, T. P., PARKINSON, B. H., and TELLSTROM, K. J. Decreases in blood eosinophilic leucocytes after electrically induced convulsions in man. *J. Clin. Endocrinol.* 9: 445-448, May 1949.

tration,<sup>22</sup> coronary occlusion, hepatic coma,<sup>20</sup> nitrogen mustard therapy, cardiac failure,<sup>23</sup> infection, and other conditions of stress. In patients with Addison's disease no fall in eosinophils is seen following severe infections because the adrenal mechanism is not intact.<sup>20</sup> For the same reason, there is no eosinopenia in patients with the Waterhouse-Friderichsen syndrome but because of rapid adrenal failure there is a rise in the total eosinophil count.<sup>24</sup>

*Eosinophils in infectious disease*—Simon in 1906 described the disappearance of eosinophils from the peripheral blood early in the course of acute infection, and stated that the return of these cells was the beginning of the period of convalescence. In 1920 Schilling described the hemogram in terms of a regenerative or degenerative reaction of the marrow to infection, and correlated this with the eosinophil response. In acute infection with good body response there is regenerative activity with leukocytosis, many juvenile forms and disappearance of eosinophils. After the acute stage has passed, the leukocytosis lessens, the "shift to the left" decreases, and eosinophils return. Later there is a relative lymphocytosis and eosinophilia, and a return of the granulocytes to normal adult forms. Failure of the eosinophils to return is considered a bad prognostic sign and is usually found in severe toxic infections in which the degenerative reaction is seen with few young forms and lack of leukocytosis.<sup>25</sup>

With attention being directed to the role of the adrenal cortex in stress phenomena and with the demonstration of an eosinophil response to the 11-oxycorticosteroids of the adrenals it is now possible to interpret the course of the eosinophils as described above. With intact and operating body defenses, there is response to infection on the part of the pituitary-adrenal mechanism causing overproduction of cortical steroids which reduces the level of circulating eosinophils. The eosinophilia of convalescence may be explained as a manifestation of the compensating state of the pituitary-adrenal mechanism. The eosinopenia in most acute viral or bacterial infections is of the order of from 5 to 30 per cu. mm., and the rise during convalescence is generally to levels of from 500 to 800 per cu. mm.

<sup>20</sup> JORD, P. H., ET AL. Eosinopenia due to glucose administration. *Proc. Soc. Exper. Biol. & Med.* 73: 43-46, Feb. 1950.

<sup>21</sup> ELLIOTT, J. M. Observation of the levels of circulating eosinophils in congestive heart failure: the possible role of the adrenal cortex in cardiac edema. preliminary report. *Labor Clin. Bull.* 6: 31-33 Apr. 1950.

<sup>22</sup> LEE, W. W., ET AL. The use of the direct eosinophil count in the diagnosis and treatment of Waterhouse-Friderichsen syndrome. *New England J. Med.* 262: 441-445, Mar. 23, 1950.

<sup>23</sup> WHITNEY, L. P. H., and BARRY, C. J. C. *Disorders of the Blood*, 5th edition. The H. B. S. Co., Philadelphia, Pa., 1948.

Certain infectious diseases vary from the typical pattern described above. In scarlet fever there is a rapid increase in the number of eosinophils, which reaches a maximum by about the sixth or seventh day—often reaching 20 percent of the differential count, or from 3,000 to 5,000 per cu. mm. This generally persists until the third week of the disease.<sup>20</sup> A similar response is noted in chorea<sup>21</sup> and it is believed by some investigators that the eosinophilia suggests the basic allergic nature of these two conditions. Pulmonary tuberculosis is not often associated with an eosinophil response in the acute stage, but there is frequently a moderate eosinophilia of from 300 to 500 in chronic stages. Significant eosinophilia develops in the marrow and peripheral blood in patients treated with streptomycin and old tuberculin.<sup>22</sup> Kirk<sup>23</sup> stated that typhoid fever is one disease in which there is complete suppression of eosinophils, and reported a series of 25 cases in which an eosinophil count of 2 percent was the highest recorded during the hospitalization of these patients.

#### SUMMARY

Although the exact role of the eosinophil in physiologic and pathologic processes is not known, there is enough correlation between eosinophil levels in the blood and certain clinical states to make information about these cells useful to the practitioner.<sup>24,25</sup> Generally there is an increase in the total eosinophil count in conditions associated with hypersensitivity reactions such as those seen in allergic states and in parasitic infestation. Eosinophilia is also seen with certain destructive skin lesions, the "collagen" diseases, certain poisonings, and certain other conditions possibly related to foreign protein and sensitivity reactions. It is also a feature of certain blood and marrow disturbances.

Eosinopenia is characteristically seen in response to stress phenomena caused by infection, surgical operation, and many other traumatic conditions. Recovery from the stress state is marked by a return of eosinophils to normal or high levels. This does not occur if the adrenal cortex is incompetent or if body defenses are failing. Thus, if the eosinophil level remains low beyond the expected time for recovery, the physician has objective evidence of a poor prog-

<sup>20</sup> FREED, R. Eosinophilia in scarlet fever as diagnostic aid. *Am. J. Dis. Child.* 49: 822-828, Apr. 1957.

<sup>21</sup> BISHOP, H. Eosinophilia occurring in chorea. *Am. J. Dis. Child.* 21: 477-482, Mar. 1927.

<sup>22</sup> JACOB, E. C. and GLASSER, F. B. Eosinophilia artificially produced by streptomycin and old tuberculin. To be published.

<sup>23</sup> KIRK, J. M. and HYCK, F. J. Clinical occurrence of eosinophils. *M. Clin. North America* 9: 913-919, July 1944.

nosis, and therapeutic measures may be instituted at the proper time. This guide has already been used in preoperative and postoperative management<sup>19,20</sup> and in the Waterhouse Friderichsen syndrome.<sup>21</sup> With further investigation and trial at the clinical level the response of eosinophils will become an even more useful guide to the practitioner in diagnosis, management and prognosis.





# Surgical Gingivectomy in Periodontal Disease

GEORGE SPIEGEL, *Capt in DC A. U. S.*

IN CONSIDERING the importance of surgical gingivectomy in periodontal treatment, it should be stressed that this treatment is only one of several treatments available to the operator. It is not my intention to elevate surgical gingivectomy to the status of a panacea for all periodontal disease, but rather to explain its use, indications, and technic.

Periodontal disease (or more commonly, pyorrhea) affects the surrounding and supporting structures of the teeth. It may be degenerative or inflammatory local or systemic, and mild or severe. Beyond the age of 50 years periodontal disease is responsible for the loss of more teeth than is dental caries. Briefly the mechanism of the disease is as follows (1) A small pocket forms between the gum and the tooth (2) food, debris, calculus, or organisms lodge in this pocket (3) this produces inflammation, which in turn causes bone loss at the base of the pocket and (4) the bone loss deepens the pocket and more debris packs into it causing further inflammation. Thus a vicious cycle progresses until ultimately the tooth is lost through lack of bony support.

The only effective treatment found so far is the elimination of the pocket and maintenance of good oral hygiene. If systemic diseases such as diabetes or nephritis are influencing the periodontal lesion, they too must be controlled if the treatment is to be successful. Eliminating the systemic factors will not however correct the damage already done to the periodontal tissues, nor will it eliminate the vicious cycle under way in the periodontal pocket. Our problem then is to treat the periodontal tissues after we have eliminated the local or systemic causes.

There are two types of treatment conservative and radical. The conservative type consist of local treatment such as (1) scaling the

Walter Reed Army Hospital, Washington, D. C.

teeth and curetting the pockets to keep them thoroughly clean, (2) the institution of good oral hygiene and toothbrush technique, and (3) the use of mild astringents to help reduce the edema. This treatment is intended gradually and gently to eliminate the pocket and restore the tissues to good health. When possible and if it produces satisfactory results this is the treatment of choice. Unfortunately there are a great number of patients in whom the condition is too far advanced, or the pocket is too deep or for some reason the tissue does not respond to conservative treatment. We must then use a more radical treatment on these patients.

Radical treatment can be of two types—removal of the soft tissues to eliminate the pocket or extraction of the tooth. Elimination of the soft tissue boundaries of the pocket is more radical than the conservative treatment described but far less radical than extraction. Dental extraction is indicated in many patients in whom the condition has progressed too long or too rapidly and has left the tooth with so little support that even if the pocket were eliminated the tooth could not withstand the stress of function, but any case which fails to respond to conservative treatment and yet is not so advanced that extraction is indicated, should receive the benefits of gingivectomy.

Gingivectomy is intended to prevent the continued advance of periodontal disease which does not respond to conservative treatment. In this way the pocket is eliminated and conservative treatment may then prove effective in controlling the disease. Gingivectomy does not cure periodontal disease—it is only an adjunct to treatment. The advantages of gingivectomy are (1) retention of the natural dentition in a healthy state for many years, (2) elimination of tedious, time-consuming treatments which may keep the condition from becoming worse but cannot induce healing because the condition is too far advanced, (3) elimination of the periodontal pocket with its associated infection, bad taste, foul breath, et cetera, and (4) allowing the retention of important individual teeth to serve as abutments and retainers.

The disadvantages of gingivectomy are principally the patient's fear of the procedure and hesitation as to the appearance of the tissues and teeth following gingivectomy. Both of these disadvantages can be minimized or overcome completely by the skill of the operator, the confidence the patient has in the operator, and the mental attitude the operator instills in the patient prior to the procedure. The operation can be satisfactorily performed under local anesthesia, but if the patient is extremely apprehensive, premedication is indicated, and even general anesthesia may be used.

The two types of gingivectomy generally employed are surgical excision and electrocautery. There is a small steadily diminishing group of proponents of chemical treatment. The difficulties involved in chemical treatment are (1) the drugs employed are not self limiting and can destroy healthy tissue (2) drug application to local areas is difficult as saliva spreads the drug into areas where its effect is not desired, (3) there can be toxic manifestations in the use of any drug particularly escharotics (4) numerous repeated applications of the drug are required to produce the effect thus prolonging the treatment and healing time and (5) there may be residual drug effects such as necrosis, sloughing irritation and inflammation after the procedure is completed.

Those who prefer electrocautery stress the fact that there is little hemorrhage, and if hemorrhage occurs it can easily be controlled. They believe the procedure is quicker and less tiring for the operator. Those who favor surgical excision believe that electrocautery has the following disadvantages (1) the depth of penetration of the instrument's effect is not accurately known (2) treatment is often followed by bone slough caused by injury to healthy bone, (3) there is some question as to the effect of electrocautery on the vitality of the teeth, (4) postoperatively the tissues react as they would after any burn, (5) prolonged healing time is often observed following this procedure, and (6) the patient may object to the odor which accompanies the use of this instrument and which often remains with the tissue for some time after its use.

The disadvantages of surgical excision are (1) the procedures usually produce profuse bleeding particularly in flabby or spongy tissue, (2) the procedures are physically tiring on the operator and (3) raw surfaces are created which may be extremely painful immediately after the effects of the anesthetic have worn off.

The Periodontia Section of the Dental Service at this hospital has favored surgical gingivectomy for the last few years and has obtained excellent results with it. The general procedure is as follows. The patient receives a thorough prophylaxis followed by conservative treatment for several weeks. If the disease is far advanced plans are made for a gingivectomy. If the disease is not far advanced, gingivectomy is not planned unless conservative treatment fails. Gingivectomy is not undertaken routinely but is used only when indicated. A complete roentgenographic study of the mouth including bite wings and models is made. Not only is this used to plan the surgical procedures and as reference during the operation but also as an aid in educating the patient. A gingivectomy will not be undertaken unless the patient not only agrees to the procedure, but also



agrees to follow rigid postoperative instructions. All phases of the procedure, its purpose and the expected esthetic result are explained to the patient beforehand. The wider the embrasures, the less is the likelihood of a satisfactory esthetic result.

Once the preliminary steps are completed, the patient is given an appointment for the gingivectomy. Usually the anesthetic is local infiltration with a 2 percent procaine hydrochloride and epinephrine 1:50,000 mixture. Premedication is not used routinely but it is available if the operator believes it is necessary. If 2 percent procaine hydrochloride does not induce sufficient anesthesia a 4 percent solution with or without epinephrine is available. Medical clearance is obtained on all patients. Because the operation is elective patients with systemic involvements which would rule out other minor operations are not subjected to it.

A modification of the Crane-Kaplan<sup>2</sup> technic is used at this hospital. It is efficient and rapid and eliminates many of the objections to surgical gingivectomy suggested by the proponents of electrocautery. The depth of the pockets is marked with pocket marking forceps (producing bleeding points) then a sharp incision is made following the pocket depth, thus producing a festooning effect. The knife is held at a slight bevel from the perpendicular to allow for rounding off the tissues. Crane and Kaplan designed a set of special knives for this procedure. These knives cut more effectively particularly in the interproximal areas, than an ordinary scalpel and were designed in pairs of right and left instruments. The original knives of this type had blunt dissectors, shaped like the knives, on the other end of the handles which were then used to dissect out the tissue which had been cut free. Recently the instruments were modified so that the right and left knives are now on opposite ends of the same handle. The dissectors, too, are now on opposite ends of the same handle. Following the excision of the diseased tissue scalars and files are used. The principle here is gradually to work down from the larger to the smaller instruments and ultimately finish with the delicate files. In this way the diseased tissue is completely removed, and the healthy tissue which is left behind receives very little trauma and thus heals more quickly.

The postsurgical dressing should (1) protect and soothe the tissues, but must not act as a foreign body thus prolonging the healing time (2) be relatively simple to apply and remain fixed in place once properly applied (3) be readily available and not so expensive as to limit

CRANE, A. B. and KAPLAN, H. The Crane-Kaplan operation for the prompt elimination of pyorrhea alveolaris. Dental Cosmos 51: 612, 1911.

CRANE, A. B. and KAPLAN, H. The technique and results of surgical pyorrhea treatment. Dental Digest 24: 2, 1932.

its use, and (4) be adaptable enough to permit the patient considerable normal function (speaking, chewing soft foods, normal tongue movements, et cetera.) Many commercial dressings meet most of the above requirements fairly well. The dressing used at this hospital is composed of zinc oxide, finely powdered rosin eugenol, and oil of bitter almond.

The mixture is spatulated to a heavy ropy consistency. It is applied gently around the necks of the teeth. Care must be taken to avoid interference with occlusion. The adaptation must be accurate, as a poorly adapted dressing has a greater tendency to break, become loose, or move and thus irritate the tissue. The dressing is changed at the end of the fifth day and is removed completely after the tenth day. Despite microscopic studies which show the importance of the full 10 days' protection, some of our patients have healed promptly even though the pack has been lost after 2 or 3 days and the patient has been unable to come in and have the pack replaced.

Once the pack has been removed the patient is put on a rigid regime of home care. This includes the use of a mild saline mouth wash, correct tooth brushing, interdental stimulation, and tissue massage. The patient is seen periodically for conservative treatment and evaluation of the adequacy of his home care. The time between visits is gradually extended until the periodontal tissues reach a satisfactory state, then only the routine semiannual check up is needed to be certain that the condition remains under control.

#### CONCLUSION

The success of this method depends on the careful selection of cases and the preoperative and postoperative cooperation of the patient.





# An Emulsion of Hexachlorocyclohexane for Scabies

SOLOMON C. ILLIG, *Lieutenant junior grade USN U S N*

SCABIES is one of the most troublesome diseases the military dermatologist is called on to treat. It was one of the leading dermatologic afflictions responsible for the loss of countless man hours in World War II. The treatment with sulfur or benzyl benzoate left much to be desired. Kornblee and Combes<sup>1</sup> stated that the clinical response to the sulfur treatment was often erratic, necessitating repeated applications. Cannon and McRae<sup>2</sup> on the other hand found benzyl benzoate to be irritating when used in different pharmaceutical forms and Shane<sup>3</sup> found it a sensitizing agent often sensitizing the patient to wool. There is a need for a nontoxic prompt acting preparation that can be applied with a minimum of effort. It is my purpose here to present a formula of this type.

A compound known as hexachlorocyclohexane (600) first manufactured in the early part of the nineteenth century appeared to offer a solution to the scabies problem. Although the gamma isomer of this compound was known for a long time it was first isolated during the period 1942-43 in pure form and found to have strong insecticidal properties. The gamma isomer in the last few years has been used in a vanishing cream base with great success and was found to be an efficient and apparently nontoxic cure for scabies and pediculosis but it required much time to apply. An emulsion that could be brushed

U. S. Naval Hospital Corps School, U. S. Naval Hospital, San Diego, Calif.

CANNON, A. D. and McRAE, M. E. Treatment of scabies: report of 100 patients treated with hexachlorocyclohexane in vanishing cream base. *J. A. M. A.* 134: 157-590 Oct. 23, 1941.

KORNBLIE, L. V. and COMBES, F. C. Gamma hexachlorocyclohexane in treatment of scabies. *Arch. Dermatol. & Syph.* 61: 407-41 Mar. 1950.

SHANE, H. J. Benzyl benzoate. I. oral dermatitis. *Canad. M. A. J.* 61: 30-4, Jan. 1949.

ILLIG, S. C. The gamma isomer of hexachlorocyclohexane. *Chem. & Indust.* 61: 40 Oct. 21, 1943.

on the skin was deemed more desirable and would do away with the former time-consuming methods of application.

*The following is a formula for an emulsion of this type*

$C_6H_5Cl_3$ (gamma isomer).....	1.0	Sodium lauryl sulfat .....	0.5
Stearyl alcohol.....	3.0	PEG 400 monolaurate .....	1.0
Cetyl alcohol.....	~ 1	Aqua q. s. ad. ....	100.0
Cotton seed oil.....	10.		

A. Dissolve the  $C_6H_5Cl_3$  in the oil by heating gently on water bath and the cetyl and stearyl alcohol and heat to  $70^{\circ}C$ .

B. Heat the distilled water to  $70^{\circ}C$  in which the sodium lauryl sulfat and PEG 400 monolaurate have been dissolved.

Add B to A stirring rapidly until cool and homogenize

Early clinical trials with this lotion were encouraging. Irritation and toxic side reactions appear to be minimal. Toxic reactions to  $C_6H_5Cl_3$  can be treated with barbiturates. It is believed that the lotion destroys the eggs as well as the parasites. It is stable at room temperature and with most compounds and it possesses the qualities of being washable and stainless. Dilute alkali, however is to be avoided as trichlorobenzene will result from the decomposition of  $C_6H_5Cl_3$ , rendering it inactive. By varying the amounts of cetyl and stearyl alcohol employed, the resulting emulsion can be made to conform to any desired thickness and viscosity. The lotion can be prepared with a minimum of expense and effort and shows great promise of solving the scabies problem in the Armed Forces.

*Polychlorinated biphenyls.*

M. N. ALL, D. P. and K. R. H. Observations on pharmacology of isomers of biphenyl chlorocyclobenzene. J. Pharmacol & Exper. Therap. 52: 149-56 Feb 1945



# Prevention of Air Sickness by Benadryl-Scopolamine Mixtures

HERMAN I. CHENY, Ph.D.

BENJAMIN A. STRICKLAND, Colonel U.S.A.F. (MC)

OLIVER H. WALTRIP, Colonel U.S.A.F. (MC)

SAMUEL H. GAINER, Lieutenant Junior Grade MC, U.S.N.

IT HAS recently been shown that the effectiveness of beta dimethyl aminoethyl benzohydryl ether 8-chlorotheophyllinate (dramamine) against motion sickness resides in the basic portion of the molecule and is not a unique property of this particular salt. Thus, beta dimethylaminoethyl benzohydryl ether hydrochloride (benadryl) has proved equally as effective as dramamine in the airplane and aboard ship.\* A combination of 50 mg. of benadryl with 0.65 mg. of scopolamine hydrobromide proved to be the most effective prophylaxis thus far reported against airsickness. Because both scopolamine and benadryl have side effects (dry mouth, blurred vision, drowsiness) which are undesirable for flying personnel it became important to test the effectiveness of reduced doses. The dose of each component of the mixture was therefore halved (0.33 mg. of scopolamine hydrobromide and 25 mg. of benadryl) and their effectiveness against airsickness again studied.

Scopolamine hydrobromide in doses of 0.65 mg. and a mixture of 25 mg. of benadryl with 0.33 mg. of scopolamine hydrobromide were distributed in capsules of identical size and appearance 1 hour prior to take-off. The testing procedure was the simulated turbulence technic perfected by Strickland et al. The results are shown in

USAF School of Aviation Medicine, Randolph Field, Tex.

Kinship Hospital, El Paso, Tex.

\* I. I. CHENY and OLIVER H. WALTRIP. Effectiveness of various drugs in prevention of air sickness. *Proc Soc Exper Biol & Med*, 73, 18, 1950.

WALTRIP, O. H. Effectiveness of newer drugs in motion sickness. *U.S. Armed Forces M. J* 1: 170-177 May 1950.

CHENY, H. I., WALTRIP, O. H., and SMITH, J. H. Prophylaxis of motion sickness evaluation of newer drugs in motion sickness. (U.S. publ. med.)

CHENY, H. I., WALTRIP, O. H., and ADLER, H. Studies in motion sickness. *J. Aviation Med* 21: 60, 1950.

table 1. The difference in the percent of airsick subjects between the two groups is not significant.

TABLE 1.—*Effectiveness of benadryl-scopolamine mixture during simulated flight*

Flight conditions	Dose (mg.)	Subjects	Airsick (percent)	
			Number	Percent
Scopolamine hydrobromide	0.65	60	21	35
Benadryl	25.00	60		35
Scopolamine hydrobromide	15			

Because final evaluation of the desirability of any preparation must be its performance under usual flying conditions, our next test was to determine the degree of protection obtained with the benadryl-scopolamine mixture in regular navigation training flights. From 30 to 60 minutes prior to take-off a capsule containing (1) 0.65 mg. of scopolamine hydrobromide, or (2) a mixture of 0.33 mg. of scopolamine hydrobromide and 25 mg. of benadryl, or (3) a lactose placebo was given to each subject. The capsules were of identical size and appearance. The subjects were so placed that there was no difference in seating arrangement among the various groups. A modified C-47 (DC-3) was employed in all flights. The duration of the flights was from 4 to 6 hours, with weather conditions varying from calm to moderate turbulence. The altitude during most of each flight was from 8,000 to 10,000 feet and in no instance above 10,000 feet. Most of the trainees had previous flying experience; less than 10 percent were making their first flight. The incidence of airsickness is shown in table 2. Unfortunately, the distribution in groups was not exactly even because of the failure of some subjects to complete their questionnaires. No person receiving the benadryl-scopolamine mixture reported either severe nausea or vomiting. Severe nausea and vomiting occurred in 7.3 percent of those receiving 0.65 mg. of scopolamine hydrobromide alone and in 16.7 percent of the group receiving the placebo.

TABLE 2.—*Effectiveness of drugs against airsickness*

Flight conditions	Dose (mg.)	Subjects	Slight nausea percent	Severe nausea percent	Vomited percent	Percent prone (dose)
Benadryl	25.00	42	8.1	0	0	100.0
Scopolamine hydrobromide	15	43	4	2.3		95
Mixture of benadryl and scopolamine	45	54		4	1.1	

Percent, the number of subjects who reported nausea percent; Severe, the number who reported severe nausea percent; Vomited, the number who reported vomiting percent; Prone, the number who reported no nausea or vomiting percent.

When only those persons who had been airsick on some earlier flight were considered, the differences among the groups became even more pronounced (table 3). There was no vomiting or severe nausea among those receiving the mixture. 0 percent in the group receiving scopolamine hydrobromide and 20.0 percent in that receiving the placebo.

TABLE 3.—Effectiveness of drugs among those previously airsick

Preflight medication	Dose (mg)	Subjects	Slight nausea (percent)	Severe nausea (percent)	Vomited (percent)	Percent protection
Benadryl.....	25.00	31	12.9	0	0	100.0
Scopolamine hydrobromide.	15					
Scopolamine hydrobromide.	65					
Placebo.....						
		44	6.4	4.5	4.5	62.4
		34	30.0	8.9	14.7	

See table 2.

The side effects of the drugs are shown in table 4. There was no difference in the incidence of drowsiness among the various groups. Those receiving benadryl-scopolamine mixture had as great an incidence of dry mouth as those receiving the larger dose of scopolamine hydrobromide, but there was a slight decrease of other side effects such as blurred vision, nervousness, excessive fatigue, and headache among the former group.

TABLE 4.—Incidence of side effects

	Benadryl-scopolamine mixture	Scopolamine hydrobromide	Placebo
	Percent	Percent	Percent
Nervousness.....	0	7.0	2.5
Drowsiness.....	10.3	11.4	12.5
Blurred vision.....	0	7.0	2.5
Dry mouth.....	21.4	23.2	5
Excessive fatigue.....	0	9.3	10.0
Headache.....	0	11.4	8.0

## DISCUSSION

The dose of scopolamine hydrobromide may be reduced with no impairment of its protective capacity when benadryl is added. In the actual training flights the mixture containing only half the usual dose of scopolamine hydrobromide was better than the full dose. The total percent affected in actual flight was about the same in both groups. The nausea resulting among those taking benadryl-scopolamine mixture however did not seem to progress beyond the mild stage whereas with scopolamine hydrobromide alone a significant percent continued to the severely nauseated stage. The side effects were slight with the reduced dose. Apart from an increased incidence of dry mouth there was no greater incidence of any symptom than in the group receiving a placebo.



## SUMMARY

A mixture of 0.33 mg. of scopolamine hydrobromide and 25 mg. of benadryl was compared with 0.65 mg. of scopolamine hydrobromide alone in the prevention of airsickness. No significant difference could be detected between the two groups when tested in the airplane using simulated turbulence for 1 hour. When actual navigator training flights were used for testing the benadryl-scopolamine mixture gave greater protection against severe nausea and vomiting than did scopolamine hydrobromide alone. Among those who had been air sick at some previous time, the incidence of severe nausea and vomiting was none with benadryl scopolamine mixture, 9 percent with scopolamine hydrobromide alone, and 20.6 percent with the placebo. The incidence of drowsiness was the same for all groups. Dry mouth was common in both the group receiving scopolamine hydrobromide and in the group receiving the benadryl-scopolamine mixture. The occurrence of blurred vision, nervousness, excessive fatigue, and headaches was lower in the group receiving the mixture than in the group receiving scopolamine hydrobromide alone.



# Surgical Correction of Mandibular Prognathism

OTTO W. WICKSTROM, *Captain MC U S A*  
RAYMOND F. HUTZSCH, *Commander DC U S N*

**M**ANDIBULAR prognathism has been defined as "abnormal protrusion of the lower jaw." Some of the causes of this condition are heredity, supernumerary teeth, abnormalities of the tongue, early loss of deciduous teeth, and late eruption of permanent teeth. Other general causes are rickets, syphilis, and diseases of childhood. In pronounced cases there is an inability to masticate food, and in many cases there is emotional instability from awareness of the deformity. Surgical interference would not be required if patients were seen early and treated by the orthodontist. Orthodontic treatment is most successful during adolescence and completion of the second stage of dentition. This treatment should be instituted as soon as the first sign of overdevelopment is detected. After puberty untreated cases become more pronounced and surgical correction is usually necessary.

There have been many successful operations performed for mandibular prognathism. Hullihen performed an intraoral operation for this deformity in 1848. Intraorally a V-shaped piece was cut two-thirds through to the jaw from above, the distal fragment was cut free, or partially free, horizontally and displaced backward. In 1897 Angle recommended operation, and Blair performed a resection between the first molar and second bicuspid on one side, and a similar resection on the other side extraorally. In 1912 Harshbarger described a method of performing a bilateral resection of the mandible posterior to the second molars for correction of prognathism. In his operation he preserved the mandibular nerve and removed a rhomboid section with the greater width of the bone segment above. He wired the cut ends of the mandible together and obtained an excellent

Departments of Plastic and Oral Surgery, U. S. Naval Hospital, Oakland, Calif.  
HARSHBARGER, W. M. Bilateral resection of jaw for prognathism; report of case. *Surg. Gynec. & Obst.* 11: 51-53, 1911.

result. New and Erich in 1941 described a method consisting of bilateral resection of a segment of the body of the mandible for mandibular prognathism. In this procedure the segment of bone on either side is removed without injury to the mandibular nerve and vessels. Dingman in 1944 described a two-stage procedure for correction of mandibular prognathism. His operation was successful and in 1948 he presented a review of his technic. His operation is a modification of the methods introduced by Harsha and by New and Erich.



Figur 1—Prognathic face showing extreme developmental mandibular prognathism. Patient lacked ability to masticate food.

Many other methods have been advocated, each of which corrects the deformity and repositions the teeth by either osteotomy or osteotomy. To reposition the teeth by osteotomy the ramus of the mandible is cut and the body of the bone moved to correct the deformity. Section may be performed by cutting across the ramus of the mandible between the mandibular sulcus and the angle of the mandible or by cutting through the necks of the condyles. The bone is held in position during healing by intermaxillary wiring. This method has been successful in many cases because it avoids injury to the inferior dental nerve and can be performed without contamination from the oral cavity. The chief disadvantages of this method are lack of control of the mandibular fragments and the possibility of injury to the facial nerve.

Osteotomy removal of a previously measured segment of bone from the body of the mandible, has been described by many leading surgeon. The bone segment is removed without injury to the alveolar

NEW, G. B. and ERICH, J. B. Partial correction of mandibular prognathism. *Am. J. Surg.* 62: 212, July 1941.

DINGMAN, R. Surgical correction of mandibular prognathism: improved method. *Am. J. Orthodontics (Am. Orth. Soc.)* 30: 675-682, Nov. 1944.

HARSHA, R. Surgical correction of developmental deformities of mandible. *Plast. & Reconstruct. Surg.* 3: 34-44, Ma. 1948.

nerve and the operation is performed in two stages intraoral and extraoral

In the case described here, the treatment was according to the method of Dingman and presented little or no technical difficulty. The malocclusion was satisfactorily improved giving a good functional and cosmetic result. The mandibular nerve and vessels were preserved. Figure 1 shows the preoperative appearance of the patient.

### SURGICAL TECHNIC

Plaster study models were made of the dental structures and accurately mounted in an articulator (fig 2). Cuts were made in the model to determine the exact size of the segments of the body of the mandible to be resected in order to obtain normal occlusion of the teeth (figs. 3, 4 and 5). Teeth in the line of the cuts were to be extracted. Templates of sheet metal were cut to correspond to the

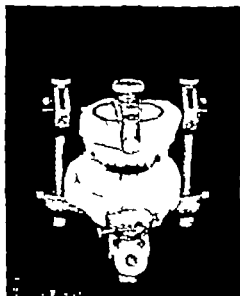


Figure 2—Anterior view of plaster model illustrating degree of prognathism.

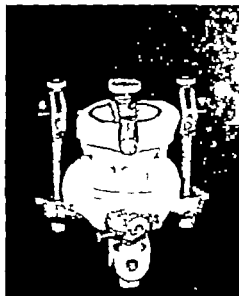
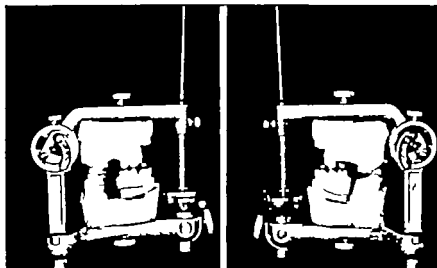


Figure 3—Anterior view. The necessary cuts have been made in the model to reposition teeth.

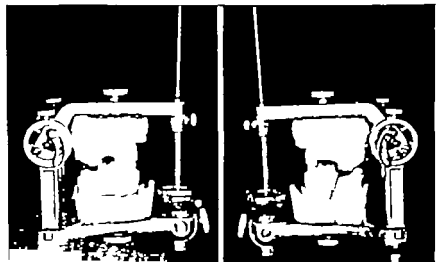
size of the segments of bone to be resected. These metal plates were used for measurement during the operation.

*Intraoral technic (first stage)*—The patient was prepared for operation. Either inferior alveolar nerve blocks or intranasal intra-tracheal anesthesia can be used. In our case local anesthesia was used. A molar tooth in the line of cut was removed. An incision was made on the crest of the alveolar ridge in the long axis down to the bone. The mucoperiosteum was elevated on both sides of the



*Figure 4—Plaster model with segment removed from right and left sides of mandible illustrating the size of bone cuts necessary to reposition the teeth. Osteotomy was performed in two stages intraoral and extraoral leaving the mandibular nerves and vessels intact.*

mandible, exposing the buccal and lingual plates of bone down to the level of the mandibular canal. The corresponding metal templates were placed on the bone and the segment of bone to be removed was outlined with an indelible pencil. The cuts were made on the buccal and lingual surfaces of the mandible down to the inferior



*Figure 5—Plaster model showing the malocclusion corrected. Mandibular segment has been removed bilaterally and teeth repositioned.*

alveolar nerve with a surgical bur mounted in a contra angle hand piece. The bone segment was likewise removed with the bur which facilitated accurate cutting of the segments. The wound was closed by suturing the mucoperiosteal flaps to cover the defect. The opposite side of the mandible was cut in a similar manner (fig 6). The patient was given penicillin during the period of healing.

*Extraoral technic (second stage)*—The intraoral wounds healed in about 2 weeks and during this period intraoral splints were constructed and firmly secured to the upper and lower teeth. These splints were used for intermaxillary wiring following the second stage operation. After all signs of inflammation subsided at the



Figure 6.—Roentgenograms of mandible showing intraoral osteotomy (first stage of operation)

operative areas, the patient was prepared for operation and the extraoral procedure was carried out under intranasal, intratracheal anesthesia. An incision about 2 inches long, was made at the lower border of the mandible at the site of the segment to be removed. The periosteum was elevated over the operative area and the previously made bone cuts were exposed. With a contra-angle dental handpiece and surgical bur the cuts were extended over the lower half of the mandible. The segments of bone between the cuts were removed and the inferior alveolar nerve and vessels were exposed. Care was taken not to damage the nerve and vessels. The same procedure was repeated on the opposite side of the mandible.



Figure 7.—Postoperative view following second stage of operation. The teeth have been repositioned and mandibular segments have been secured by interosseous and intermaxillary wiring.

An assistant outside of the operative field then brought the teeth into occlusion and the removed segments of bone were checked for accuracy. The occlusion was satisfactory so the cut ends of the mandible were held in position by interosseous wiring. The teeth were held in position by intermaxillary wiring (fig 7). The periosteum was sutured to cover the bone cuts and the external wounds were closed in anatomic layers. Pressure dressings were applied to the mandible to prevent soft tissue swelling. The patient was given penicillin and feeding was carried out as in patients with intermaxillary wiring. The mandible was immobilized for 2 months, after which a recheck



Figure 8.—Postoperative view showing prognathism corrected and teeth in occlusion.

of the roentgenograms revealed the cut ends of the fragments to be well united and the appliances were removed (fig 8)

#### SUMMARY

In the case presented the prognathism was developmental and caused the patient embarrassment and difficulty in eating. Incising and masticating of food was impossible because of the degree of prognathism and the lack of occlusion of posterior teeth caused by the loss of numerous bicuspid and molar teeth. The method of osteotomy was selected as the most feasible and as involving the least risk. The inferior alveolar nerves and vessels were exposed and paresthesia existed for 2 months, after which normal sensation returned to the lower lips and soft structures.







# An Improved Duplication Procedure for Dentures

FRANCIS W. SHAFER, *M for DC U S. A.*

THE following duplication technic was instituted at this laboratory early in 1948 in an attempt to improve the partial denture service for our stations. The results were gratifying and worth the additional effort in reproducing accurate stone duplications on which to fabricate partial dentures. When models for partial dentures are received from a station they are accurately surveyed for retentive zones for clasps and undesirable interproximal areas are eliminated by means of undercut wax. A good combination is one stick of hard inlay wax and two sheets of baseplate wax melted together. The surveyed models are then sent to the duplication bench for further processing. All areas which are not directly involved in the denture, such as peripheral rolls beyond saddle zones, labial peripheries which are excessively undercut, or any other imperfections which may interfere with the withdrawal of the master model from the agar (hydrocolloid) are eliminated by blocking out with plasticine or modeling clay.

Because agar materials will adhere tenaciously to gypsum products and all dental models contain gypsum, the models should be immersed in water for 20 minutes. This will facilitate the removal of the model from the agar. At the same time excess air in the model will have dispersed itself and will not appear in the hydrocolloid impression. The temperature of the water for immersion should be 125° F in order not to melt the undercut wax and to warm the model so the agar material does not "freeze" while pouring on a cold model. When model stone or gypsum materials are immersed in water, instead of expanding as one would expect they contract. Although definite shrinkage will occur in longer periods, the shrinkage in 20 minutes is less than 0.01 percent. This is negligible when all other factors affecting dental materials are considered. When the agar has been melted and tempered to from 125° to 130° F the warmed

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Fifth Army Central Dental Laboratory St. Louis, Mo.

model is placed in the duplication flask and the hydrocolloid is poured slowly over the model, completely filling the flask.

In order to obtain uniform results all procedures are timed by means of an interval timer. The filled flask is air-cooled for 5 minutes, half submerged for 5 minutes in water at 70° F., then completely submerged for 10 minutes (or until gelation has occurred). *The master model can be removed from the flask and a model stone* can be poured into the impression and allowed to solidify for 45 minutes. At this time the agar can be peeled off the model and used over again.

With this procedure we are able to save additional time for the dental operator because we have a duplicate of the master model in case of breakage in handling. Models that are received and broken through mailing can sometimes be pieced together and duplicated by this procedure. Because we fabricate the partial denture on the duplicate model we are able to try the finished denture on the master model. Thus we are able to check the accuracy of the clasps and denture, realizing that if the denture fits the master model and not the mouth, the original impression or model was inaccurate. By carefully surveying and designing partial dentures and eliminating undesirable undercuts, and using a duplicate model with these undesirable factors eliminated, the finished dentures should fit the patient's jaw without unnecessary trimming and time-consuming adjustments on the part of the dental officer.



# Bronchogenic Carcinoma

## A Study of 100 Microscopically Proved Cases

ROBERT B. BROWN, Captain MC U S A

LANDRAY R. RIDDLE, Commander MC U S A

MELVIN B. SULLIVAN JR., Lieutenant Junior Grade MC U S A R.

WITHIN the past few years great strides have been made in the surgical treatment of bronchogenic carcinoma.<sup>1-4</sup> On the other hand the treatment of this disease still is not so successful as it has been represented. In the large thoracic surgical centers, with a substantial percent of referred patients, considerable selection of cases is unavoidable. Those undiagnosed ante mortem and many of the obviously inoperable patients do not reach these institutions.

We have studied 100 unselected consecutive histories of patients with microscopically proved bronchogenic carcinoma admitted to a general hospital in the past 3 years. All of our patients were men, as might be expected in a hospital of this type. Seventy percent were in the sixth decade of life (fig. 1). This finding emphasizes the importance of complete investigation of seemingly trivial pulmonary symptoms in patients of this age. In 98 percent of the patients in our series, on whom an admission photofluoroscopic examination was made, an abnormality was noted which demanded further investigation. These findings suggest the possibility of using mass photofluoroscopic examination of the male population in this age group as a means of detecting early asymptomatic lesions. A breakdown of our material in terms of occupation, use of tobacco, and exposure to respiratory irritants was attempted, but no statistically significant data were obtained.

U. S. Naval Hospital, Philadelphia, Pa.

OSCAR A. DUBOIS, M.D. Thesis: J. L. Primary cancer of lung. J. A. M. A. 133: 321-32, Oct. 11, 1944.

CHURCHILL, E. D. Primary carcinoma of lung. J. A. M. A. 137: 443-461, May 29, 1948.

BROWN, W. F. JR. Clinical analysis and follow-up study of 502 cases of carcinoma of lung. IM Chest 17: 33-54, 1950.

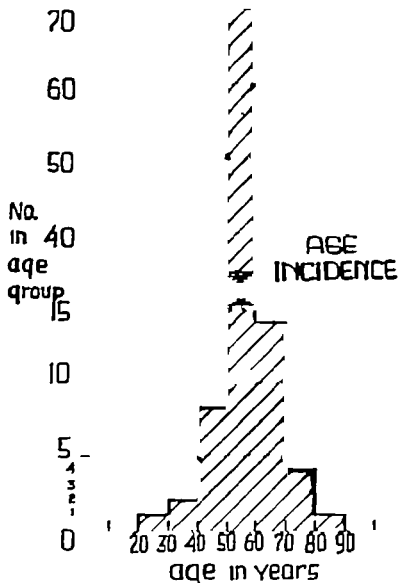


Figure 1.

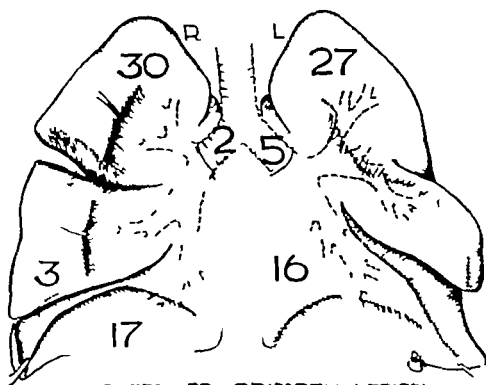
## PATHOLOGY

The locations of the primary lesions are shown in figure 2. Fifty-seven percent of the tumors were in the upper lobes, where bronchoscopic visualization and obtaining a specimen for biopsy are most difficult. Classified by the microscopic findings, the tumors may be divided into three groups. There were 54 percent squamous cell carcinoma, 32 percent small cell or undifferentiated carcinomas, and

14 percent adenocarcinomas. Little correlation between cell type and prognosis could be established in this small series. Forty-six cases were examined at autopsy, and metastases were present in all. The sites of metastases are tabulated in table 1. The incidence of metastasis to the adrenal glands was high.

TABLE 1—Incidence of metastasis in 46 autopsies

Location	Number
Mediastinum	27
Lymph nodes, other than mediastinal	20
Adrenal	16
Various abdominal viscera	12
Kidney	11
Heart and vessels	10
Bone	7
Pancreas	5
Pericardium	6
Esophagus	4
Brain	4
Mesentery	4
Opposite lung	3
Skin	3
Diaphragm and pleura	2



LOCATION OF PRIMARY LESION  
IN 100 CASES

Figure 2

## CLINICAL FEATURES

Presenting symptoms in our series varied greatly and were far from diagnostic in the early stages. Cough, chest pain, blood-streaked sputum, and weight loss were the most common. A change in the character of a preexisting cough, and repeated or prolonged episodes of pneumonitis, which respond temporarily to antibiotics, are to be regarded with particular suspicion. Positive physical findings were minimal, except in far-advanced cases. The delay between the initial symptoms and admission to the hospital is represented in figure 3. Although the majority of patients were admitted within the first 4 months, a substantial number were admitted 10 months or more after the onset of symptoms. The prognosis was poorest in these, and this emphasizes the need for further education of both the public and the medical profession.

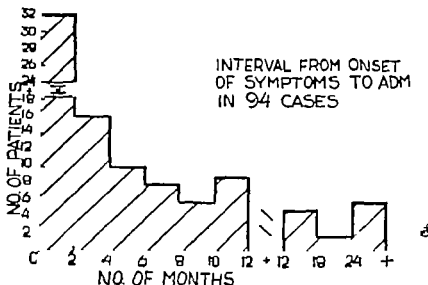


Figure 3.

The time interval between admission and surgical exploration is shown in figure 4. The majority of patients were operated on between 3 and 5 weeks after admission. This period seems somewhat long but several factors are involved. In this hospital diagnostic work ups are necessarily done after admission in most cases. Also, thorough preoperative investigation and preparation from the standpoint of the cardiovascular respiratory and renal systems are necessary in this age group. There seems to be little excuse, however for the delays of 10, 12, or 16 weeks, which occurred all too frequently.

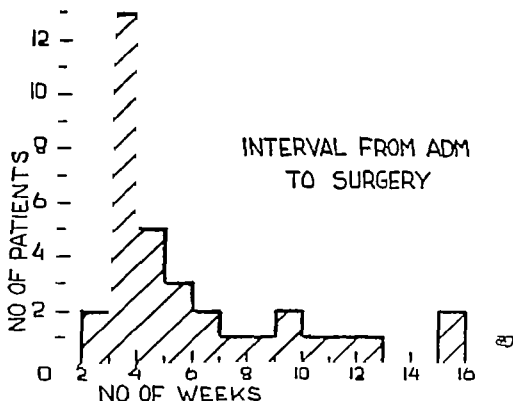


Figure 4

## DIAGNOSIS

The admission diagnosis was unrelated to pulmonary disease in 24 percent of cases. This emphasizes again the vagueness of the early symptoms in bronchogenic carcinoma and the importance of routine photofluoroscopic examination on admission to the hospital. Roentgen examination of the chest is by far the most important diagnostic tool at our disposal. In all patients of the present series, abnormal shadows demanding further study were present at some time.

Bronchoscopic examination and biopsy are important diagnostic procedures, especially for the microscopic confirmation of clinical and roentgen diagnoses. In 34 percent of our patients a positive diagnosis was thus established. In patients with more peripheral lesions, beyond the reach of the bronchoscope indirect evidence may still be obtained by the microscopic examination of aspirated secretions, the finding of a distorted or fixed carina, or the presence of pus or blood in a bronchial lumen. Bronchograms occasionally may be helpful in finding an early lesion beyond the reach of the bronchoscope and without clear-cut findings on routine chest roentgenograms.

In patients with suspected or proved bronchogenic carcinoma, biopsy of enlarged supraclavicular or axillary lymph nodes should be



obtained. If a diagnosis of metastatic carcinoma is made needless exploratory thoracotomy is avoided.

If, with the help of these diagnostic aids, the presence of bronchogenic carcinoma cannot be established or ruled out, exploratory thoracotomy should be performed. With present-day refinements in anesthesia surgical technique antibiotics, and replacement therapy thoracotomy carries a mortality and morbidity comparable to that of exploratory laparotomy.

The methods by which the microscopic diagnosis was established in our series are tabulated in table 2. In 20 patients a definite diagnosis was established only at autopsy. In fairness, however, it should be stated that the correct diagnosis in many of these cases was strongly suggested by clinical and roentgen findings ante mortem. Lymph node biopsy was the means of establishing a diagnosis in 14 of our patients; the examination of bronchial secretions by the Papanicolaou method confirmed the diagnosis in 2 patients; the demonstration of malignant cells in pleural fluid was diagnostic in 1 patient. Exploratory thoracotomy was required for a definite diagnosis in the remaining 17 patients.

TABLE 2.—Establishment of diagnosis

Method	Number
Bronchoscopic biopsy	37
Autopsy	20
Thoracotomy	17
Node biopsy	14
Bronchoscopic Papanicolaou stain	2
Pleural fluid cells	1
Total	100

#### TREATMENT

Twenty-six of the one hundred cases under study were never seen by the surgical department either because they were considered inoperable by the medical department, or because the diagnosis was not considered prior to postmortem examination. Two patients were considered operable but refused operation and another left the hospital against advice before studies could be completed. Of the remaining 74 patients, 37 were adjudged inoperable at the time of surgical consultation. The reasons for refusing to perform an exploratory operation on patients with suspected or proved bronchogenic carcinoma were the demonstration of distant metastases in 12, massive extension to the chest wall in 7, recurrent nerve paralysis in 4, and a general physical condition incompatible with a major operation in 10. Bronchoscopic demonstration of endobronchial extension of the tumor to the carina also was considered a contraindication to operation in 4 patients.

Surgical exploration was performed on 34 patients, and in 15 invasion of vital mediastinal structures by tumor precluded palliative or curative resection. One patient died on the operating table before the chest was opened. At autopsy the lesion was found to be inoperable. Resection was performed on the remaining 18 patients. The procedures carried out are represented in figure 5. Limited involvement of the pericardium and chest wall were not considered contraindications to resection and the involved tissues were included in the dissection, but with little hope for cure.

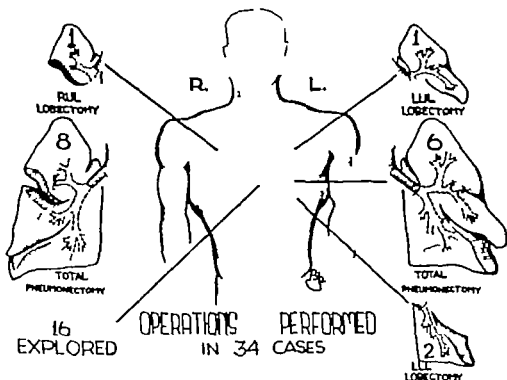


Figure 5

Pneumonectomy, as the procedure of choice in the treatment of bronchogenic carcinoma was performed in 14 of the 18 resected cases. Lobectomy was performed on 4 patients for "coin" type peripheral lesions with no gross evidence of extension to hilar or mediastinal nodes. In 2 instances in which the diagnosis had not been established until after resection, it was decided at the operation that the criteria for adequate cancer surgery had been fulfilled by the lobectomy. In the remaining 2 patients, lobectomy was a planned procedure, 1 had an extremely low preoperative vital capacity, and the other had just recovered from a spontaneous pneumothorax on the opposite side.

Fourteen inoperable or nonresectable patients received palliative roentgen therapy, with considerable temporary benefit in most in

stances. One outstanding result was obtained. This patient, who had a nonresectable adenocarcinoma of the right upper lobe, received 10,500 roentgens over a 5-week period, and was active and gaining weight 17 months later. Recent follow-up films show that the tumor shadow has disappeared and that the atelectasis of the upper lobe has completely cleared. Interestingly enough, this patient was apparently cured of a squamous cell carcinoma of the tonsil by roentgen therapy several years previously. Five patients, inoperable or nonresectable, received a course of nitrogen mustard in addition to roentgen therapy but only one was benefited. This is in disagreement with several recent reports which suggest that palliation comparable to that obtained with roentgen therapy may be obtained with the nitrogen mustards, particularly in anaplastic tumors.

### RESULTS

Of the 66 patients not operated on, 2 were alive both in this hospital with terminal carcinomas. Of the 34 on whom exploratory operation was performed, 10 were considered nonresectable, and most of these were given palliative roentgen therapy. Of these 1 survived for 4 and 1 for 17 months. Of the 18 resected, the operation was completed in 4 patients with the knowledge that a palliative procedure only was being performed. Of these, 3 were dead and 1 was alive with a known recurrence. Of the 14 resected with a hope for cure, 4 were dead, 2 were alive with known recurrence, and 8 were alive without demonstrable recurrence. The longest period of survival was 22 months. There were 2 deaths in the group of 34 patients subjected to operation, an operative mortality of 5.9 percent. In 1 patient who was a poor operative risk, the heart stopped, while he was on the table for an exploratory thoracotomy before the chest had been opened. The opening of the thorax was rapidly performed with a hope of restoring cardiac action, but the hemithorax was so completely filled with adherent carcinomatous tissue and "drowned lung" that the heart could not be exposed satisfactorily for immediate massage. The other death occurred suddenly on the eighth postoperative day apparently as the result of myocardial infarction. Permission for autopsy was refused. The operative mortality for the 16 resected cases was 5.6 percent.

KENT, L., and RYAN, E. P. Treatment of bronchogenic carcinoma with nitrogen mustard. *Dis. Chest* 194 1954

REBOUR, C. P. Recent advances in treatment of cancer. *J. A. M. A.* 154 394-396, Jan. 31, 1948

As of August 1954

## SUMMARY

Of 100 consecutive cases of microscopically proved bronchogenic carcinoma 70 percent occurred in patients between 50 and 60 years of age. All patients were men. Frequent mass photofluoroscopic examination of men of this age group is suggested as a means of detecting early silent lesions. The long interval between the onset of symptoms and admission to the hospital in many cases emphasizes the necessity for further educating both the public and the physician to the importance of complete and early investigation of pulmonary symptoms in the older age groups. Delay in diagnosis and treatment within the hospital is apparent, and this should be corrected. The importance of exploratory thoracotomy is stressed. Thirty four percent were operable 18 percent were resectable and the operative mortality was 5.0 percent.





# Carcinoma in Situ of the Cervix Uteri

LAURENCE G. ROTH *Lieutenant Colonel, U. S. A.*

**C**ARCINOMA in situ of the cervix has been described by various authors as noninvasive potential carcinoma of the cervix, Bowen's disease of the cervix, incipient carcinoma of the cervix, preinvasive carcinoma of the cervix, superficial noninvasive carcinoma of the cervix, and intraepithelial carcinoma of the cervix. That this entity has been described so variously is a reflection of the hesitancy to accept as carcinoma a condition which does not show invasion, heretofore a requisite condition for the diagnosis of any cancer. Carcinoma in situ of the cervix is, however, to be regarded as a form of carcinoma. Its occurrence is significant and presents several problems, some of which are illustrated by the case reported.

## CASE REPORT

A 48-year old white married para 0, gravida 6 housewife was admitted to the gynecology service of this hospital on 8 April 1947. She had been seen first in the orthopedic clinic with a chief complaint of backache of 4 years' duration. Examination was negative and she was seen in consultation because of a history of possible puerperal infection in 1938. On repeated questioning by several examiners, she recalled infrequent episodes of postcoital bleeding during the previous 12 or 15 years. Menses were regular and normal. The pregnancies had been normal and uncomplicated. Venereal disease was denied. The past history and review of systems was negative. The family history was pertinent in that both the mother and father of the patient had died of cancer. General physical examination was negative. Routine urinalysis, complete blood count, and serology were negative.

On 10 April pelvic examination under anesthesia revealed only an enlarged chronically infected cervix with erosion ectropion and bleeding on manipulation. Curettage of the uterus obtained normal luteal phase endometrium. Specimens of the cervix at 4 and 11 o'clock

were taken for biopsy. The pathologist reported chronic cervicitis and healing erosion with squamous epidermidization of the glandular structures. Suspicion was aroused by certain areas of the basement layer of the epidermal covering appearing irregular and broken up by the chronic inflammatory reaction. Because of these findings trachelectomy removing the proximal 3.5 cm. of the cervix, was performed on 19 April. Following examination at various levels the pathologist reported chronic cervicitis and healing erosion.

The cervical stump healed uneventfully and the patient was free of all symptoms other than those relative to functional backache.



Figure 1.—Low-power photomicrograph of the modification of the normal squamous epithelial architecture with tendency toward basilar hyperactivity and atypical cells in the superficial layer. Atypia is more distinct in the epithelium at the right.

Repeated vaginal smears were negative. In January 1940 nodular induration of the cervical stump and bleeding on manipulation were noted. Further observation was advised in view of the negative smears and absence of symptoms. I first saw the patient in September. Examination at this time revealed persistent, irregular consistency of the cervical stump with bleeding on manipulation, and palpable thickening at the base of both broad ligaments which had not been noticed previously. Because of these findings, the sections from the biopsy and anputation of the cervix were reviewed and the blocks recut. Representative sections are shown in figures 1 to 6. Several consulting pathologists agreed that carcinoma in situ of the cervix was present, and the possibility of invasive carcinoma was



Figure 2—Low-power photomicrograph. Note the changes in the squamous epithelium with loss of stratification and cellular atypicism.

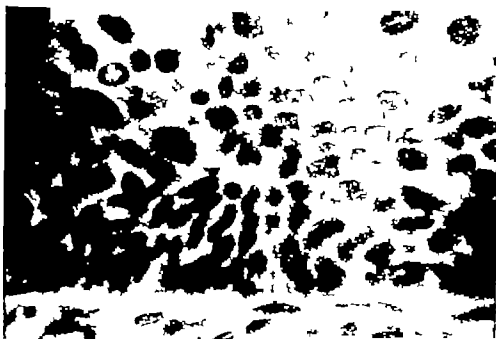


Figure 3—High-power photomicrograph of the squamous epithelium in figure 2. Note the abnormal cell with hyperchromatism, loss of polarity, increase and variation in size and shape of nuclei, and mitotic figures.





Figure 4.—Low-power photomicrograph. Note the loss of normal stratification and cellular changes involving all layers. Squamous metaplasia is noted in the upper right corner.



Figure 5.—High-power photomicrograph of an area from figure 4. Note the variation in size, shape, and staining reaction of the various cells. The cell with the large horseshoe-shaped nucleus in the center is representative of the type of cell present in polypoid cytoplasmic tumors from invasive carcinoma of the cervix.

suggested. The clinical findings suggested recurrence of the primary carcinoma and indicated the need for further investigation.

An exploratory laparotomy was performed in October. No abnormalities of the abdominal viscera were noted. The pelvic viscera were normal except for a rubbery thickening at the base of both broad ligaments. There were no palpable masses or lymph nodes in the iliac, hypogastric, obturator, pararectal and preaortic area. A radical panhysterosalpingo-oophorectomy was performed removing en bloc all of the tissue lying medial to the two ureters and a generous vaginal cuff with its surrounding fascia. The procedure was well tolerated and the postoperative course was uneventful. Gross and micro-



Figure 6—Low power photomicrograph of a cervical gland replaced by squamous epithelium. The absence of normal stratification and the atypical cells particularly near the basement membrane are considered significant. This would be variously diagnosed as squamous metaplasia, carcinoma in situ and in situ carcinoma of a cervical gland.

scopic examination failed to reveal carcinoma. The parametrial tissues contained a dense fibrous connective tissue. The pathologist reported that sections of the cervical stump showed cervical stroma lined by fragments of stratified squamous epithelium. There were cystically dilated glands, scattered lymphocytes and macrophages containing old blood pigment. Convalescence was uneventful and the patient resumed full activity. Examination at the time of the writing of this article was negative. Further follow up examination was indicated.

## COMMENT

The significant feature of this case is the establishment of the diagnosis of carcinoma in situ 2 years and 5 months after the original treatment. This experience is not unusual, but it emphasizes the importance of a careful and thorough investigation of all lesions of the cervix with serial or step sections of the specimen. With respect to the significance of carcinoma in situ of the cervix, many patients deserve reevaluation of their cervical lesions. It is the responsibility of the gynecologist to examine pathologic specimens completely in this manner and to follow the progress of these lesions subsequent to treatment with examination, repeated biopsy and cytologic smear. Without doubt the diagnosis of carcinoma in situ of the cervix has not been established in many instances when an inadequate pathologic and diagnostic study has been carried out and a diagnosis of benign disease made. The review of all cervical lesions will yield many more cases of carcinoma in situ of the cervix and obtain additional information that is needed to evaluate this disease.

Although the present result is good, amputation of the cervix is not to be regarded as adequate treatment. There are reports of recurrence following amputation. Galvin and TeLinde and Younge, Hertig and Armstrong recommend total hysterectomy. The presence or absence of involvement of the cervical glands is a focal point for differential treatment. TeLinde regards cervical gland involvement as invasion. His studies have repeatedly shown glandular involvement which would not be removed by amputation. Hertig regards involvement of the cervical glands as preinvasive reasoning that the glands are epithelial structures in continuity with the surface epithelium and that the intact basement membrane is a barrier between epithelium and stroma. In the absence of glandular involvement Younge, Hertig and Armstrong recommend the use of cautery or coagulation with close follow up of results using the Schiller test, cytologic smears, and repeated biopsy studies. In summarizing their 135 cases, they list amputation as adequate treatment in the absence of cervical gland involvement. They consider secondary irradiation after amputation adequate in the presence of gland involvement.

The occurrence of postcoital bleeding in the case presented here was not considered significant. Abnormal vaginal bleeding is the

KERRY, R. V. Superficial noninvasive intraepithelial cancer of cervix. *Am. J. Obst. & Gynec.* 217: 149, Sept. 34.

GALVIN, G. A. and TE LINDE, E. W. Progress of status of noninvasive cervical carcinoma. *Am. J. Obst. & Gynec.* 57: 5-16 Jan. 1949.

YOUNGE, P. A., HERTIG, A. T. and ARMSTRONG, D. Study of 135 cases of carcinoma in situ of cervix. *Finn. Hospital for Women. Am. J. Obst. & Gynec.* 58: 867-885, Nov. 1948.

only prominent symptom noted in large series of cases. This is not diagnostic, for half of the patients are asymptomatic when the diagnosis is established.

The photomicrographs show a variety of epithelial changes. The finding of such a variety in the same specimen is not unusual. All grades listed by Hertig from basal hyperactivity to anaplasia and carcinoma in situ with and without cervical gland changes may be seen in serial sections of a cervix with carcinoma in situ. Significantly, similar changes were described in 1912 by Schottlaender and Kermauner<sup>8</sup> in their report of epithelial cytologic changes at the periphery of invasive carcinoma of the cervix. There are still persons of mature judgment who deny that carcinoma in situ is true carcinoma. This difference of interpretation depends on the absence of invasion, but does not consider the biologic evidence which is being accumulated. Acceptance of the significance of cytologic changes has been accelerated by the study of exfoliated cells in vaginal secretions and the smear made with the cervical scraper of Ayre.<sup>7</sup>

#### DISCUSSION

The most recent review of the literature lists 18 cases of untreated carcinoma in situ which have progressed to invasion. These reports by competent observers are to be highly regarded. These 18 cases are the result of error in the original diagnosis or refusal by the patient to accept adequate treatment. One case reported by Lounge Hertig and Armstrong is particularly significant in that treatment was deliberately avoided. This decision was made only after another competent pathologist had disagreed with the diagnosis. The diagnosis was made on routine biopsy of a mildly eroded but clinically benign cervix. Under observation, repeated biopsy studies showed persistent in situ carcinoma. Biopsy 11 months later suggested invasion and amputation was performed. Serial sections revealed invasive carcinoma at the site of the original carcinoma in situ. In this clinical experiment, carcinoma in situ developed into a frankly invasive but symptomless, carcinoma in 11 months. With such evidence, it is difficult to deny that carcinoma in situ is true carcinoma but at an early stage.

One of the first considerations in any discussion of carcinoma of the cervix is what are adequate numbers and types of biopsy specimens? Techniques of obtaining specimens for biopsy and new instruments for

SCHOTTLANDER, DEB. and KERMAUNER. Zur Kenntnis des Intra-cervicallcarcinoms. Verlag von R. Karger, Berlin, 1912.

PAPANICOLAOU, G. N. and TRITTY, H. F. Diagnosis of Uterine Cancer by the Vaginal Smear. The Commonwealth Fund, New York, N. Y. 1942.

AYRE, J. E. Vaginal smears—preinvasive cell studies using modified technique. Am. J. Obst. & Gynec. 81: 1205-1219, Dec. 1942.

obtaining specimens of the cervix for biopsy are being tried out and their use reported. The adequacy of the specimens for biopsy is related to the fundamental problem in management of carcinoma of the cervix, i. e., the difficulty of determining the extent of the disease. The presence or absence of invasion is frequently not determined until amputation of the cervix or total hysterectomy is accomplished. If involvement of the cervical glands is accepted as invasion, step section of the entire cervix might be necessary in the management of these patients. Galvin and T Lankle found invasion of the cervical glands in 50 of their 75 patients and because of this they recommended total hysterectomy for all patients with carcinoma in situ. The burden of proof of lack of invasion rests with the gynecologist for the finding of an in situ lesion means (1) it was obtained from the periphery of an invasive carcinoma, (2) there is involvement of the cervical glands, or (3) there are changes in the surface epithelium only. This differentiation must be made.

The importance of repeated examination and repeated diagnostic procedures such as the Schiller test, biopsy, and the cytologic smear is evident. The evidence for the relationship of infection and trauma to carcinoma of the cervix is equivocal, the disease occurring in both benign and diseased cervixes. For follow up, the cytologic smear is of great value. Younge, Hertig, and Armstrong obtained 83 percent positive smears when there was involvement of the cervical glands and 53 percent positive smears with involvement of the surface epithelium only.

In this clinic, three primary diagnoses of carcinoma in situ have been established in the past 6 months. All three of these patients were asymptomatic and the cervixes appeared clinically benign. The diagnoses would not have been established except that surprisingly positive smears led to further diagnostic investigation. The incidence of carcinoma in situ in cervixes which are clinically benign is reported as 1.2 percent. This experience suggests that more widespread use of smears will increase the general incidence of carcinoma in situ of the cervix when combined with adequate biopsy techniques.

If TeLande's concept that involvement of the cervical glands represent invasion is correct, then the finding of 50 cases with invasion in 75 cases is significant. In their recent surgical experience Morris and Mager report an 18 percent incidence of lymph node metastasis in clinical Stage I carcinoma of the cervix. Thus, the presence of lymphatic pelvic extension is not incredible in carcinoma in situ of the cervix. Their findings highlight the inadequacy of clinical staging and help to explain the 39 to 41 percent failure to cure Stage I car-

cinoma with irradiation. The patients with carcinoma in situ treated by total hysterectomy have been operated on recently to evaluate results in terms of cure rates.

Following such reasoning, the objection will be raised that total hysterectomy is inadequate for carcinoma in situ and then the question will be how radical should the operation be? In his interesting study Henriksen<sup>9</sup> reports a 20 percent error in the interpretation of the pathologic status of lymph nodes based on the gross appearance at operation and autopsy. In addition, preoperative irradiation may cause such a distinct tissue reaction that the surgeon is unable to differentiate between pure irradiation effect and malignant extension. Henriksen also reports that carcinoma of the cervix is not the localized disease it is commonly assumed to be. He found distant metastases in 27 percent of untreated and 53 percent of treated patients with carcinoma of the cervix.

Although irradiation would appear to be the treatment of choice for carcinoma in situ, a localized lesion, the morbidity and mortality rate following irradiation alone is not insignificant. The only death in Galvin and TeLinde's series followed irradiation. The radio sensitivity of carcinoma in situ has not been determined, and indeed we have no means of predicting the radio sensitivity of any carcinoma. As Morris and Meigs<sup>8</sup> concluded, irradiation is, at best, a blind procedure. The dosage delivered to the tumor cannot be determined accurately and the many variables in such therapy preclude determining the cancerocidal dose for individual tumors.

Our present knowledge of carcinoma of the cervix, including the in situ variety, is based on morphologic studies. There is an urgent need for the ability to determine the biologic potential of each individual carcinoma. It is safe to predict that the results of treatment will not improve greatly until the gynecologist is able to evaluate each tumor individually and treat it accordingly. The average patient is a fiction of statistical study and usually bears little resemblance to the individual patient that will obey the "all or none" principle in regard to cure.

Black, Bolker, and Kleiner<sup>10</sup> recently reviewed the present knowledge of the biology of malignancy. They point out the evidence for all forms of malignancy assuming behavior patterns and characteristics with a strong central tendency. Carcinoma of the cervix has a significant number of characteristics common to all varieties of malignancy. Local manifestations may vary, but there is a surpris-

11. VRIK, P. Lymphatic spread of carcinoma of cervix and of body of uterus. Study of 4 necropsies. *Am. J. Obst. & Gynec.* 35: 874-881, N. 1949.

10. BLACK, K. M. M., BOLKER, H. and KLEINER, J. R. Some generalization of morphology and metabolism in malignant neoplasia. *New York State J. Med.* 54: 300-313 Feb. 1, 1950.

ing uniformity of alterations of the body milieu. Biochemical studies of the tumor and studies of the body tissues and changes in the blood and urine of the tumor host show an appreciable uniformity of results. There is alteration of glycolysis and associated oxidation enzymes in the tumor. Liver metabolism and cytochemical activity are altered. There are changes in serum fluorescence and the reducing power fibrinogen content and heat coagulation of plasma. The excretion of specific and nonspecific steroids, and gonadotropic and splenotropic substances has been demonstrated.

Greene and Newton<sup>11</sup> reported significant findings in their study of uterine carcinoma in the rabbit. They found that there was a gradual transformation from neoplasia to malignancy with its abilities of invasion, extension, metastasis, and autonomy. This was strengthened by the demonstration of a definite relationship to the constitution of the host in this transformation to malignancy. Tumors capable of autologous transplantation must undergo additional transformation before they are capable of homologous transplantation. Black, Bolker and Kleiner conclude, "Further work on cancer as a systemic disease in general and the tumor host relationship specifically appears justified at this time."

These observations and conclusions are pertinent to the consideration of carcinoma in situ of the cervix. The average age incidence is about 10 years less than that of invasive carcinoma of the cervix, suggesting a dormant or latent period of neoplasia before malignant transformation occurs. Thus, carcinoma in situ is comparable to the tumor that can be transplanted autologously but not homologously. Such latency is not unlikely when consideration is given to the common instances of extensive invasive carcinoma of the cervix occurring with minimal symptoms of short duration. Further evidence is offered by the report of 12 years delay before invasion in one case of untreated carcinoma in situ of the cervix.

Most of the patients are in the 30- to 35-year-old age group. The fact that many of them are in the child-bearing age may be the most important practical factor in differential treatment. Younger has permitted some of his patients to become pregnant after conservative therapy. With close observation, no adverse consequences have been encountered in these carefully selected patients. To avoid the subjective and objective effects of castration, TeLinde<sup>12</sup> recommends preservation of ovarian function when total hysterectomy is performed.

GREENE, H. B. & NEWTON, B. L. Evolution of cancer of uterine fundus in rabbit. *Cancer*, 32-99 May 1949.

TELINDE, R. W. Epithelial carcinoma (in situ) of cervix uteri. *Surg., Gynec. & Obst.* 51: 782-794, June 1949.

Conservative surgery should prove adequate in most instances. Investigation of the systemic body changes should yield further information in approaching satisfactory individualization of treatment, and should be accomplished in subsequent study of carcinoma in situ of the cervix. Refinement and simplification of these tests will aid not only in the diagnosis of the extent of the disease but will also serve as checks on the progress of therapy. If the results of treatment are to approach cure in every instance of carcinoma in situ of the cervix, such aids in estimating the systemic involvement will have to be developed and used. Reports of both success and failure after all methods of treatment are found in the literature. We must admit that our clinical ability to estimate the extent of carcinoma of the cervix in every case is inadequate. The extent of treatment must approach the extent of the disease for each patient to overcome the weakness of routine treatment of any type based purely on the morphology of the local lesion.

Many physicians selectively limit the use of the cytologic smear to patients 35 years of age or older or to those in whom the gross appearance of the cervix suggests malignancy. The accumulating evidence indicates the error of this selection. A smear should be taken whenever there is any lesion of the cervix, regardless of gross appearance, symptoms, or the age of the patient. Whenever facilities are available, a specimen for biopsy should be taken routinely before cautery or more extensive treatment is given. Many adequate biopsy instruments are available and this procedure can be performed adequately and safely on the ambulatory patient.

It is only by the increased use of these diagnostic aids that a greater number of cases of carcinoma in situ of the cervix will be discovered. The diagnosis should be made, for here is an unequalled opportunity to treat a neoplastic growth of low grade malignancy before it is transformed to a cancer with a 40 to 45 percent failure rate in its most favorable stage. Unlike any other part of the body with a comparable incidence of malignancy the cervix is easily accessible to adequate examination. Using present diagnostic aids, carcinoma in situ of the cervix should be detected and a high cure rate obtained. In time additional aids to evaluate the extent of the disease, the biologic potentialities of the local growth and the constitution of the host will give ideal results for each patient instead of the present prospect of a percentage result for the average patient.

#### SUMMARY

The real incidence of carcinoma in situ will become evident through more frequent use of the diagnostic aids and methods now available and the review of lesions of the cervix with serial or step sections of



the pathologic specimens. Treatment of these lesions offers a great opportunity to solve the problem of carcinoma of the cervix. More information concerning carcinoma of the cervix as a systemic disease and the tumor host relationship is needed. Application of such information will be of value in determining the extent of the disease and the response to therapy. Satisfactory individualization of treatment for a significant increase in cure of carcinoma of the cervix will be possible only after such information is available and applicable to individual patients.



# Amebiasis With Hepatic Abscess and Pleuropulmonary Involvement<sup>1</sup>

RYLE A. RADKE, Colonel MC 1 SA

**T**HIS article reports a case of a complication of intestinal amebiasis which is rarely encountered having been found only once in 101 patients with intestinal amebiasis treated at this hospital. Others have recorded its occurrence in from 5 to 15 percent of cases. Although Ochsner and DeBailey<sup>2</sup> found pleural or pulmonary involvement in 15.8 percent of a series collected from the literature and their personal experience, they point out that a lower incidence of liver abscess was recorded during the period 1938 to 1941. They attribute this to earlier diagnosis and more effective treatment of intestinal amebiasis. Liver involvement was found in 9.2 percent of 748 patients diagnosed as having intestinal amebiasis in the United States troops in India during World War II. Of the 69 cases with liver involvement 26 percent had abnormal pulmonary findings, but only 1 had pleural effusion. The World War II data as well as our experience appear to confirm the downward trend in incidence of this complication noted by Ochsner and DeBailey.

As early as 1828 the frequent association of liver abscess and ulcerative dysentery was noted but the direct etiologic connection was not then appreciated. After Losch<sup>3</sup> in 1875 described the *Endamoeba* which he recovered from the stool of a Russian peasant and with which he fulfilled all of Koch's postulates except the culture in pure form, Kartulis<sup>4</sup> in 1886 was able to find *Endamoeba histolytica* in 19 of 20 patients with liver abscess. He recovered motile trophozoites from the abscess pus of one of these patients. In 1890 Osler<sup>5</sup> found

U S Army Hospital, Fort Knox, Ky.  
PROGERS F A, JR. and W STEPHEN, E F. Amebiasis with pulmonary involvement. Arch Surg 35 304-315, Sept. 1947.  
OCHSNER A., and DEBAILEY M. Amebic hepatitis and hepatic abscess. Analysis of 181 cases with review of literature. Surgery 13 460 M 1943 G1., Apr. 1943.  
KLATSIS G. Amebiasis of liver: classification, diagnosis and treatment. Ann. Int. Med. 23 641-651, Oct. 1946.  
LOSCH F. Massenbefall mitwirkend von amöben im Dickdarm. Arch f Path. Anat. 61 100-111, Nov. 1875.  
KARTULIS. Ueber Tropische Leberabscesse. Arch f Path. Anat. 193 5 1 1886.  
OSLER W. On meta coli in dysentery and in dysenteric liver abscess. Bull. Johns Hopkins Hosp. 1 52, May 1890.

amebas in the pus and stools of a patient with liver abscess but stated that their etiologic connection with the disease was questionable. Shortly thereafter Councilman and LaFleur<sup>9</sup> published their observations on a number of patients and reached the conclusion that the amebas were undoubtedly concerned with the production of the liver and lung disease associated with amebic dysentery. Since that time the causal relationship between the amebas and such complications of amebiasis as hepatic abscess and pulmonary disease has been accepted in America.

Ipecac as a remedy for dysentery was employed by the Peruvians and introduced in Europe by Piso. It was used successfully to treat Louis XIV and was widely employed thereafter. In 1912 its ether soluble alkaloid, emetine, was shown by Vedder<sup>10</sup> to be useful in treating amebiasis and by Rogers<sup>11</sup> to be useful in treating the hepatic and pleuropulmonary complications. That it is not completely successful, is attested by the continuing search for new amebicidal drugs. In 1946 a patient with pleuropulmonary complication of intestinal amebiasis had been given two courses of 0.8 gram each of emetine intramuscularly within a month and still remained gravely ill. He was then given quinacrine with a successful therapeutic result. This stimulated further study of the effects of quinacrine in amebiasis.<sup>12</sup> As a result of these studies the case reported here was treated with quinacrine.

#### CASE REPORT

A 36-year-old gravely ill man was seen on 24 September 1949. He had been well and a chest roentgenogram was negative at the time he left his station in Germany on 8 September. On 12 September he developed a sharp persistent pain over the lower portion of the right side of the chest associated with slight fever but no cough. The pain was not affected by respiration, but was made worse by movement of the body and was referred to the back in the right subcapular area. He lost his appetite for all except cold foods and his fever became more severe. On 22 September the back pain became continuous and severe. He had lost 50 pounds since 1942 when he began having short intermittent attacks of diarrhea while on duty in Panama.

Physical examination on admission revealed an acutely ill man with a temperature of 102.8° F. Lagging inspiration, dullness to per-

COUNCILMAN, W. T. and LAFLEUR, H. A. Amebic dysentery. *Johns Hopkins Hosp. Rep.* Vol. 2, 303, Nov. 7, 8, 1919, 1921.

VEDDER, D. B. Origin and present status of emetine treatment of amebic dysentery. *J. A. M. A.* 52 Feb. 1914.

ROGERS, L. Rapid cure of amebic dysentery and hepatitis by hypodermic injections of soluble salt of emetine. *Brit. M. J.* 1: 434 June 1, 1947.

RAO, K. A. Treatment of amebiasis with taberna combined with carbamez. To be published.

cussion, and absence of breath sounds and tactile fremitus were noted on the right side. His liver was palpable 4 and his spleen 3 finger breadths below the costal margin (fig 1). His liver was tender. The leukocyte count was 15,800 with 77 percent neutrophils. There was a trace of albumin in the urine. The pleural fluid was straw-colored and contained 650 leukocytes per cu mm. Smears and cultures of this fluid were negative. There was 10 percent bromsulfalein retention 45 minutes after giving the dye.



Figure 1—Roentgenogram of abdomen at start of treatment showing hepatic and splenic enlargement.

On admission he was erroneously thought to have bacterial pulmonary involvement (figs. 2 and 3) and treatment with penicillin was instituted while bacterial cultures were being studied. He developed erythema multiforme and the penicillin was discontinued. On 3 October stool specimens were found to contain cysts of *E. histolytica*. On 4 October sigmoidoscopic examination revealed extensive ulcerations of the rectosigmoidal area. Aspirated specimens from these lesions contained trophozoites and cysts of *E. histolytica*. The patient was given 0.1 gram of quinacrine q i d on 4 October and subsequently for 18 days. His temperature returned to normal within 36 hours after starting this treatment and his clinical condition improved. In the belief that the previous allergic reaction was caused by amebiasis, penicillin therapy was reinstituted. A severe angioneurotic edema developed and the drug was discontinued. The patient's temperature fluctuated between 98 and 99.6 F. The liver



*Figure 4.—Lateral roentgen gram of chest after completion of therapy.*



*Figure 5.—Anteroposterior roentgenogram of chest after completion of therapy.*



Figure 6—Roentgenogram of abdomen at time of pulmonary relapse. Liver and spleen no longer enlarged.

#### DISCUSSION

The diagnosis of intestinal amebiasis with hepatic abscess and pleuropulmonary involvement was proved in this case by the recovery of *E. histolytica* from the stool or intestinal mucosa on four occasions and from the sputum on two occasions. Normal mucosa and negative smears and cultures from mucosal aspirations from six sigmoidoscopic examinations were taken as evidence of recovery from the intestinal disease. Disappearance of hepatic tenderness and enlargement 4 months prior to discharge were taken as evidence of healing of the hepatic abscess. The stability of the pulmonary condition by roentgenogram and physical findings for 2 months was taken as evidence of healing of the pleuropulmonary involvement. The author believes that quinacrine played a decisive role in the patient's recovery since he became afebrile on two occasions within 30 hours after starting treatment with quinacrine and the intestinal lesions and hepatic lesions showed definite evidence of having healed during the first course of therapy with this drug. That carbarsone had no effect on the pulmonary disease was shown by the patient's relapse when quinacrine was discontinued and carbarsone started. Aureomycin, in the dosage used, appeared to have no effect on the amebias within the pleural cavity because motile trophozoites were recovered on two occasions 7 days after therapy with the drug was started and the fever continued unabated until quinacrine was restarted.

was carried out. The pathologist at this time reported a "talcum powder granuloma." Wide excision of this indurated area was accomplished in August, removing skin, subcutaneous tissue, and fascia. The material removed was an extremely indurated thick layer of subcutaneous tissue which was distinguishable from the thickened fascia in this area. The hernia repair was firm and there was no evidence of recurrence. The wound was left open and closed 5 days later. In December 1950 the patient was well and there was no evidence of recurrence.

#### COMMENT

The serious potentialities resulting from the use of talcum powder in gloves are well demonstrated by this case. This patient's recurring condition incapacitated him for a year. Reactions to talcum powder are not confined to subcutaneous tissues, but include severe pelvic and peritoneal abscesses and adhesions, granulomas at the site of hemorrhoidectomy fistulas, and chronic draining sinuses. Greco proved by animal experimentation that talcum powder caused adhesions between intestinal loops and the parietal peritoneum. There is some controversy among writers as to whether the amount of powder introduced into a wound influences the severity of the reaction to the powder. Most investigators now believe that the severity of the reaction is directly proportional to the amount of talcum powder introduced. During operations the glove may tear introducing relatively large amounts of this foreign body into the wound. It has been estimated that tear or puncture of surgical gloves occurs in 5 percent of all operations.

The danger of talcum powder is often not appreciated by surgeons because of the long interval that frequently occurs between the deposition of the powder and the appearance of the lesion. It is difficult to explain why talcum powder will remain in the skin with little obvious reaction in some persons then years later instigate a foreign body reaction. One case report indicated a lesion that had been dormant for 36 years. Also because only an occasional patient suffers from this condition, proper attention may not be given to its seriousness. Lachtman et al. in a review of the literature stated that one author found it necessary to perform radical resections in two patients who had severe rectal strictures caused by talcum powder granuloma.

ROBERTS, G. B. B. Overlooked of Gallipoli tube due to surgical glove talc effluvia granuloma. *Brit J Surg* 3: 417-423, Apr. 1947.

EVENMAN, B., REID, M. G. and WOMACK, N. A. Talcum powder granuloma: frequent and serious postoperative complication. *Ann. Surg.* 124: 829-832, Nov. 1947.

R. KEY, T. L. and DONALDSON, F. M. Gynecostomy inflammation produced by foreign body irritants. *J. Internat. Coll. Surgeons* 2: 8-10, Feb. 1949.

LI, YUAN, A. L., M. DONALD, J. R. DIXON, C. P. and MAX, F. C. Talc granuloma. *Surg. Gynec. & Obst.* 83: 331-346, Oct. 1946.

while another author performed bowel resection in several patients because of severe adhesions of the intestines caused by talcum powder.

The pathologic changes in these granuloma consist of dense infiltration of the involved tissue with chronic inflammatory cells, mostly lymphocytes. Large giant cells are situated throughout the tissue. Closely related to and frequently surrounded by these giant cells are the refractile talcum powder spicules. These could at least be identified by the use of polarized light microscopy. If polarized light were used more frequently many more talcum powder granuloma would probably be recognized. Many patients reoperated on had been incorrectly diagnosed prior to the recognition of the properties of talcum powder for causing such granuloma. No evidence of destruction of these nonabsorbable particles is seen so that the reaction by no means resolves the condition. Cessation is not curative. The lesions are microscopically similar to tubercles and in fact are often confused with those of tuberculosis or regional enteritis.

#### SUMMARY

This case illustrates the serious disability that can be caused by the use of talcum powder as a dusting agent. The literature reviewed is unanimous in condemning this agent as a dusting powder in surgery.



white male veteran with such a cyst which was removed surgically Conklin<sup>14</sup> reported 2 more cases.

The following case illustrates still another such cyst that was treated successfully by surgical means.

#### CASE REPORT

A 62-year-old white male veteran of World War I was admitted to this hospital on 1 April 1950 with a history of "nervousness" and "nervous breakdowns" of long duration. He stated that his nervous condition followed a fall in 1923. Since 1930 he had been hospitalized 11 times usually for minor operations. He complained of continuous headaches, numbness of the arms and legs, back pain, dizzy spells, and a choking sensation. A tumor on his heart was discovered in 1949 in the course of a routine check for tuberculosis. Subsequently he was hospitalized twice elsewhere and a re-evaluation was made concerning the tumor. Each time it was believed that no surgical treatment was indicated since the roentgenograms did not show any enlargement of the tumor. He was admitted primarily to have the tumor removed. Since he first learned of the presence of the tumor his general psychogenic musculoskeletal symptoms had become more severe despite reassurance by numerous physicians that, in all probability the tumor mass was not the cause of his symptoms. He was seen on the medical service and given a thorough examination. He

was likewise seen in consultation by the neuropsychiatrist and given clearance for any indicated operation. The roentgenologist diagnosed the condition as a pericardial celomic cyst (figs. 1, 2, and 3). The Tumor Board concurred in the diagnosis and recommended surgical exploration and removal of the tumor mass. All findings were essentially normal except for his neuropsychiatric condition and the growth in the chest.

*Operative findings.*—On 3 May 1950 the patient was operated on. The left side of the chest was entered



Figure 1.—Roentgenogram of the mediastinum on lateral view.



Figure 2—Roentgenogram of the mediastinum on expiration. Note the change in contour of lesion in the two phases of respiration

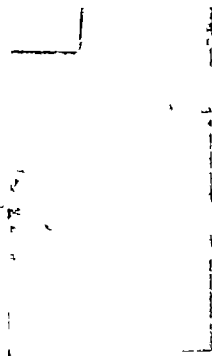


Figure 3—Oblique roentgenogram of mediastinum



Figure 4—Lesion prior to removal.



# Portuguese Man-of-War Sting

WARREN E. KLEIN *Captain, MC U S N*  
ROBERT H. BRADSHAW *Commander MC U S N*

PERSONS swimming in tropical waters are not infrequently stung by a variety of marine animals, coelenterates being the most common agents. These organisms are found either as free-swimming jellyfish (medusae) or as sessile polyps. Sessile polyps resemble plants as they have stalked bodies and flowerlike crowns of tentacles. The tentacles of both forms bear numerous small stinging structures called nematocysts which contain barbs. When a tentacle comes in contact with any organism each nematocyst discharges a small barb and a minute quantity of toxin into the victim's skin. The severity of the reaction to such attack depends primarily on the number of stings sustained and the type of toxin injected. Reactions vary from mild local skin irritation to profound systemic reactions.

## CLINICAL CHARACTERISTICS

The Portuguese man-of-war is a large colonial coelenterate which floats by means of a brightly colored air bladder. The stringlike tentacles of this assemblage of organisms stretch for several yards around it. These jellyfish often are found together in large numbers being brought close to shore in certain seasons by storms or varying ocean currents. A person coming in contact with a tentacle immediately receives many sharp stings, and the exposed part quickly shows erythematous streaks or patches where contact is made with individual nematocysts. Pain, swelling, and redness occur in the affected part. Systemic effects, following severe stings, appear in from a few minutes to an hour and include anxiety, muscular pains and cramps, dyspnea, constriction of the throat, cardiac weakness, and prostration.

## CASE REPORT

A 20-year-old white man was swimming on 30 April 1950 about 20 feet off North Miami Beach when his attention was drawn to a purple

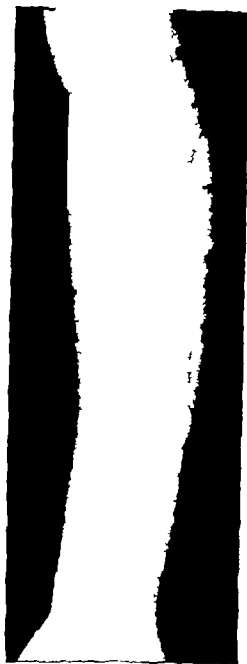


Figure 1.

object floating about 1 foot from his position in the water. Thinking it was a balloon, he swam up and touched it. He was immediately aware of a sharp painful stinging sensation on his right forearm and right scapular region. Looking at his arm he noted six or eight strands which he could not brush off. He left the water immediately and a companion removed the adherent strands by means of a towel. Each strand, when removed, left a painful fiery red welt. In a few moments he experienced difficulty in breathing and was seized with severe abdominal cramps. He was removed to the St. Francis Hospital, Miami, Fla. where he showed signs of mental confusion and shock. He was given 10 cc. of calcium gluconate intravenously, 4 cc. of benadryl intravenously and 2 cc. intramuscularly, 1 cc. of epinephrine in 2 doses intramuscularly, 0.4 mg. of atropine intramuscularly and ammonia was applied locally.

The patient returned to his station and was seen on 1 May at this dispensary at which time he presented the picture portrayed in figures 1 and 2. In addition to the

lesions as shown, there was slight swelling of the right hand, with numbness and stiffness of the joints of the fingers. There were no unusual systemic signs or symptoms but there was moderate itching

of the affected areas. The temperature, pulse respiration, and blood pressure were all within normal limits. The itching areas were treated with tetracaine ointment and the patient was sent to duty. On 3 May the lesions were slightly less inflamed and there was no itching swelling or numbness. Nineteen days were required for fading of the lesions in the right scapular area and 24 days for the lesions on the right arm. At the end of these periods a faint white hairlike scar was all that remained of the original lesions.



Figure 2.

#### CONCLUSIONS

The violence and rapidity of onset of the symptoms following coelenterate stings would lead one to believe that a powerful neurotoxin was injected. Many persons have experienced the sting of the Portuguese man-of-war, and innumerable swimmers have made unpleasant contact with sessile polyps and with live coral, reporting severe local pain and at times, markedly delayed fading of the resulting erythematous mark. The involved area may be cool to the

touch, suggesting local vasomotor reaction. This reaction may persist for periods up to several weeks.

The method of removal of the tentacles employed in this case was ideal and is strongly recommended, as attempts to brush the tentacles away will only lead to further stings and possibly to extensive, confluent lesions which may break down and become resistant to treatment. The emergency measures employed in this case were effective and adequate. Local application of analgesic ointment is recommended.



# About the Army Medical Service

## Officer Personnel Procurement in the Army Medical Service<sup>1</sup>

PAUL L. ROBINSON *Brigadier General, M O U S. A.*

AS SPECIALIZATION progresses, the concept of the medical team becomes more and more important. No longer can we formulate staffing tables for the Medical Corps alone, nor for the Nurse Corps, the Medical Service Corps, or the Women's Medical Specialist Corps. Neither can we effect intelligent assignments against these staffing tables until we study each officer as an individual. Reasons for this necessity can be illustrated by mention of several fields: we have anesthetists in both the Medical Corps and the Army Nurse Corps; many of our command and staff positions are being shifted from Medical Corps to Medical Service Corps as the training and experience in the latter progress; food service functions are being shifted rapidly from officers of the Medical Service Corps to the Women's Medical Specialist Corps; many laboratory functions are now performed by those in the Allied Sciences Section of the Medical Service Corps. In general, these trends have resulted from the basic principle that a job should be accomplished by the least highly trained person who can perform it adequately. It naturally follows that such a job is done better because it represents the primary interest of the individual.

In procurement, however, the various Corps of the Medical Service present distinct and different problems. In the 3 years immediately preceding the hostilities in Korea, we had been increasing the number of officers in the Medical Corps through our intern and residency programs in both military and civilian hospitals. Progress was phenomenal, in that we gained in these 3 years more physicians for the Regular Army than had been so commissioned in the previous 30 years. We were fortunate in being able to offer a medical officer's

<sup>1</sup>Presented by General Robinson to the Conference of Leaders of Professional Nursing on Long Range Planning for Procurement of Nurses for the Armed Forces, at Washington, D. C., on 5 January 1951.

Chief Personnel Division, Office of the Surgeon General, Department of the Army



salary in addition to the prime desire of all young physicians namely postgraduate training but we had no program which would produce the number of volunteer officers required to meet an emergency and the Korean outbreak emphasized that deficiency. The medical profession and the Congress quickly took the matter in hand and passed legislation to require service of physicians, dentists, and veterinarians. As a result of Public Law 779 81st Congress, the veterinary officer requirements will be met by volunteers, and the dental officer requirements will probably be met by recalled Reserve officers. It seems possible at this time, that medical officer requirements will not be met except by invoking the draft.

The chief reason for this is not lack of patriotism or a sense of responsibility on the part of the physicians of the nation. Continuation of postgraduate training is the chief desire of all young medical men, and they are willing to take a chance on anything to avoid interruption of their education. Postgraduate training also enters into the procurement problem in two of the three sections of the Women's Medical Specialist Corps.

Except for our allied scientists and others with special qualifications, Medical Service Corps procurement is being satisfactorily accomplished by involuntary recall of Reserve officers and by accepting volunteers.

Our Nurse Corps has traditionally been staffed with volunteers. The various nursing associations have always been quick to recognize our problems and to meet them promptly and directly. The state quota system, which they have used on more than one occasion, has been most impressive. We believe that our requirements are modest. Under the newest planning criteria, we require 3,400 nurses from civil life in this fiscal year. Of that number 3,000 are needed at once. This requirement which has already been sent to the respective states will provide a peak of 7,845 nurses in uniform. The other 400 will be needed before the end of the fiscal year (30 June 1951).

Our professional nursing needs today are being provided by both military and civilian nurses, and no doubt we will always use a limited number of civilian nurses. Although it is not possible to use them on a one to one replacement basis for Army nurses, because of legal restrictions on their hours of employment and the fact that they may not be available for all the staffing periods because of family responsibilities, and other personal considerations, they have been an important source of assistance to us. We have in planning our needs for the fiscal year considered that we shall use the services of at least 600 civilian nurses, which is about the number now on duty with the Army.

Although our requirements may be considered low in comparison with those of civilians, we have long endeavored to train and use our enlisted technicians to assist our nurses in carrying out nonprofessional duties. We are fully cognizant of the movement in civil life to accomplish nursing service by means of nursing personnel with varying degrees of training. Through the efforts and contribution of nurses assigned to the management research functions in this office, studies are being conducted to determine the most effective and economical use of nursing personnel and the degree of training necessary to meet the various nursing situations which must be covered in military medical installations. We are ready to participate in any planning for the future and to lend our support to progressive studies in furtherance and improvement of medical and nursing care





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## BOOK REVIEWS

**Freud Dictionary of Psychoanalysis**, edited by *Viktor Fodor* Associate of the Association for the Advancement of Psychotherapy and *Frank Gayner* co-author of the "Dictionary of Industrial Psychology" with a preface by *Theodor Reik* author of "Listening with the Third Ear" 208 pages. Philosophical Library New York, N. Y., publishers, 1940. Price \$3.75.

In this short book the author undertakes to present direct quotations from Freud's writings in his original terms in effort to thwart misunderstandings and misinterpretations. The work is carefully prepared and annotated, listing the titles of the papers and books from which the excerpts are taken. Because Freud's thinking in psychoanalysis continually developed and changed, in many instances successive quotations are presented to demonstrate the development of his thoughts and hypotheses. A close study of Freud's writings is an essential part of the training of every psychoanalyst no matter what school of psychiatry he may adhere to. It should, therefore, be familiar with the material quoted in this book, but it may serve as a ready reference volume and as a guide for further study. As such it will also be helpful to the workers in associated fields such as cultural anthropology and the social sciences who are becoming increasingly alert to the value of psychoanalytic theory in their own pursuits. This volume cannot, however, be used as a textbook or means of acquiring a superficial knowledge of the complexities of psychoanalysis.

—*COMM. d. P. H. Ooko, M. O. U. S. N.*

**Physiology of the Eye, Clinical Application**, by *Francis Heed Adler* M. A., M. D. F. A. C. S., *William F. Norris* and *George E. de Schweinitz* Professor of Ophthalmology School of Medicine University of Pennsylvania and Consulting Surgeon, Wills Hospital, Philadelphia 700 pages with 310 illustrations, including 2 in color. The C. V. Mosby Co., St. Louis, Mo., publisher 1950. Price \$12.

This text is unlike most text on ophthalmology in that it deals with the clinical application of known physiologic principles. It, therefore, is of great value to the practicing ophthalmologist, as well as the student in ophthalmology and the physiologist. At the end of each of the 22 chapters is an extensive bibliography which one can use for additional information on selected ophthalmologic topics. The illustrations are excellent and complement the excellence of the text. This is a "must book" for all ophthalmologists and especially those preparing for a career in this specialty.—*Les. Admiral C. A. Farness M. O. U. S. N.*

**An Integrated Practice of Medicine, Volume V** pages 4135-4867 by *H. H. Hays* and *Thomas Hays* 734 pages. W. B. Saunders Co. Philadelphia, Pa., publisher 1950. Price \$10.

This book masterfully prepared and beautifully written, presenting an up-to-date survey of medical thought, research, and practice. The introduction comprises brief comments on bacterial "fastness," the various types of hyper-

sensitivity and related syndromes with their therapeutic implications. Then follows in alphabetical order a review of almost 500 antibiotics with yellow fever. Much space is devoted to ATTH and related preparations. Graphs and tables augment the presentation throughout the book. The antibiotic spectra of the various antibiotics currently used is presented in a table in a simple form so that one needs only to name the disease to be treated and then read below which of the antibiotics is most effective. The various antitubercular agents are similarly presented. A new approach is used in discussing the treatment of specific conditions. It consists of outlining the principles of diagnosis and therapy under each disease heading. Following this are discussed (1) prophylaxis, (2) immediate care (3) continuing care (favorable course) and (4) continuing care (unfavorable course). Neoplasms are covered under such headings as "Cancer Detection," "Specialized Diagnostic Procedures," "Antitumorogenic Therapeutic Measures," and "Inoperable Malignancy." References are up to date throughout and direct the reader's attention not only to the earlier volumes in this series, but also to the literature in general. The book can be recommended for all practitioners of the art of medicine.

—*Commander B. L. Cronin Jr. MC USN*

**Newer Concepts of Inflammation**, by *Valby McLean M. A. M. D.* Associate Professor of Experimental Pathology Head of Experimental Pathology, Agnes Barr Chase Foundation for Cancer Research, Temple University School of Medicine. Formerly Assistant Professor of Pathology, Duke University School of Medicine. Formerly Assistant Professor of Pathology, Harvard University Medical School. Presented before the Midwest Seminar of Dental Medicine, Maxwellton Braces, Bailey's Harbor Wisconsin, September 19-23, 1948. 146 pages illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$3.50.

The author a world authority on inflammation has collected this small series of his lectures for physicians and dentists. He reviews the recent studies which have elucidated the basic mechanisms involved in inflammatory reactions, defining inflammation as a manifestation of severe cellular injury in vertebrate animals, or the complex vascular, lymphatic, and local tissue reaction elicited in higher animals by the presence of micro-organisms or of nonviable irritants. Many of the biologic attributes of inflammation result from the liberation by the injured cell of certain substances. The author shows how the pH of the exudate affects the cytology of the inflamed area. Inert materials (dyes were used) and bacteria are fixed in situ in these areas. This has led to an important differentiation between bacterial virulence and invasiveness. The role of inflammation in local and general immunity is discussed. The substances produced by injured cells include leukotaxine (the factor which increases capillary permeability) a leukocyte-stimulating factor having a thermolabile and a thermostable component, necrocin, pyrexin, leukopenin and the leukopenic factor glucose and possibly a growth promoting factor which hastens tissue repair.

The text is supplemented by many charts, graphs, photomicrographs and extensive footnotes. Bibliographic references are included at the end of each chapter. Unfortunately little editorial change was made from the lecture style in which these papers were originally written but this does not seriously detract from the value of the work for both pathologist and clinician.

—*Col. W. O. Brandstadt MC USN*

**Vernal Conjunctivitis**, by *M. H. Beigelman*, M. D. Clinical Professor of Surgery (Ophthalmology) University of Southern California School of Medicine. Senior Attending Ophthalmologist, Cedars of Lebanon Hospital. Attending Eye Pathologist, Los Angeles County Hospital with a foreword by *Sir W. Stewart D. de-Bilder* KCOV., M. A., D. Sc. (St. And.) Ph. D. (Lond.) M. D. Ch. B., F. R. C. S., Hon. D. Sc. (Northwestern) 420 pages. University of Southern California Press, Los Angeles, Calif., publisher 1930. Price \$3.

This easily readable monograph is the latest word on a rare disease, and in it is reviewed all the pertinent literature as far back as 1846. There are 40 figures, 7 of these in color and 14 tables. The author summarizes 226 case histories. The bibliographic references are grouped according to the years in which they were published.

The name of the disease does not reveal its cause, which is unknown. The idea that allergy may play a part is gaining support and the use of radiant energy has become an established procedure in therapy. The disease occurs most often in males between the age of 6 years and puberty. A racial predilection does not exist. There is a familial tendency but hereditary factors are not proved. There are regional variations in the types of vernal conjunctivitis, but the reasons are not understood. The subjective symptoms are itching, photophobia, burning, lacrimation, and sensation simulating the presence of a foreign body. The author lists various classifications of the disease, the most comprehensive of which is that of Weakamp. The papillary excrescences on the lids, pericorneal thickening, pale blue color white or Horner Trantas points, pseudogonorrhea, pseudomembrane, stringy secretion, eosinophilia in the tears, and vascular changes revealed by the slit lamp are aids in making the diagnosis. Trachoma, phlyctenular conjunctivitis, infectious granuloma, neoplasms, allergic conjunctivitis, and follicular conjunctivitis, all of which may be associated with vernal conjunctivitis but must be differentiated from it. The association with vasomotor instability status thymicolymphaticus, endocrine disturbances, changes in blood chemistry specific hypersensitiveness, and nasal and cutaneous lesions are discussed. Histologically the collagenous and reticular fibers are greatly increased and are subject to hyalin degeneration, and numerous eosinophils and plasma cells are found. These changes can undergo a spontaneous complete recovery usually within 10 years.

Therapy consists of ice packs, eye drops of cocaine and epinephrine, irrigation with slightly acid solution, antihistaminics by mouth, removal to a cooler climate, removal of large proliferations, subconjunctival injections of epinephrine, and radiation therapy.—*Commander L. L. Kenney, MC U. S. N.*

**Clinical Therapeutic Radiology** by *U. F. Portmann*, M. D. editor. Head of Department of Therapeutic Radiology Cleveland Clinic Foundation. Professor of Therapeutic Radiology Bunts Educational Institute Cleveland. 748 pages illustrated. Thomas Nelson & Sons, New York, N. Y., publisher 1930. Price \$15.

This is a first edition of a compilation of the works of well-selected authors, covering all phases of the clinical application of roentgen and radium therapy in benign and malignant conditions. Subjects are more or less uniformly approached. The classification of tumors of the various glands or systems is generally simplified, from the radiologist's viewpoint, but accepted by the pathologist and clinician. Treatment is outlined according to the given classification with regard to sensitivity and behavior of the lesion. The authors outline specifically their own methods of treatment and give facts and figures of their

results, some comparing the end results with those of other groups or those obtained by other methods of application of radium or therapy. Treatment for metastases and irradiation sequelae is discussed by the individual authors. The chapters on tumors of the testes and treatment of diseases of the skeletal system, joints, and soft tissues are comprehensive and especially well done. Treatment of cancer of the cervix with transvaginal x rays, interstitial radium, and intracavitary radium is covered by three authors. The use of hormones as an adjunct to therapy is separately discussed by various writers giving their criteria, methods, and results. Radiolabels and radionuclides are briefly but adequately described with a more detailed discussion of the use of radioactive iodine in diseases of the thyroid gland. The volume is made more complete by minimal chapters covering protection, sensitivity of tissue biologic effects and other closely related subjects, and contact and superelectron radiation. This book is well printed, clearly illustrated, adequately indexed, with comprehensive chapter bibliographies.—*Commander F A Rouff MC USN*

**A Textbook of X-ray Diagnosis, by British Authors, in Four Volumes Vol. III**  
 Edited by *S Cockrane Shanks, M.D. F.R.C.P., F.F.R.*, Director X-ray Diagnostic Department, University College Hospital, London and *Peter Kerley M.D. F.R.C.P. F.F.R., D.M.R.E.*, Director X-ray Department Westminster Hospital Radiologist, Royal Chest Hospital, London.  
 2d edition. 830 pages 604 illustrations. W B. Saunders Co Philadelphia, Pa., publisher 1950. Price \$18.

The revision of this outstanding work is most welcome. It is 12 years since the first edition appeared. The new edition has been made into 4 instead of the original 3 volumes. Its change in format gives to volume 3 the entire realm of the abdomen and its contents. In the earlier edition the urinary and male genital tracts were covered in another volume. The excellence of the illustrations has been maintained. It is regretted that one of the senior editors, Dr Twining, has died, although he did not contribute to the subject matter of this volume in the earlier edition. The volume is divided into sections on (1) the alimentary tract, (2) the biliary tract (3) the abdomen (liver, spleen, and pancreas) (4) radiology in obstetrics, (5) radiology in gynecology and (6) the urinary tract. The section on the alimentary tract includes radiologic findings in children. The sections on obstetrics and gynecology are entirely new and include different techniques used in pelvimetry. The volume succeeds in bringing the subject up to date and most radiologists will want to own it.—*Col Alexander O Hoff MC USA*

**Nervous and Neurohumoral Regulation of Intestinal Motility by W B Youmans,**  
*M.D. Professor of Physiology University of Oregon Medical School.*  
 183 pages 82 illustrations. Interscience Publishers, Inc., New York, N.Y., publisher 1949. Price \$4.50.

This physiologic monograph is expertly written and covers most of the known work on gastrointestinal motility from the standpoint of extrinsic nerve regulation. Primarily this book embodies the author's contributions to this subject from 1933 to 1948, but the pertinent literature is also reviewed. In accordance with true scientific standards, terms are defined, the basic anatomy and physiology are reviewed, and investigational preparations and methods of recording are critically analyzed. The inhibitory effect of epinephrine on the gastrointestinal tract is demonstrated and the effects of sympathetic preganglionic and postganglionic denervations explained. This is important clinically because of the high degree of sensitization of the musculature to epinephrine which occurs following postganglionic section.

The inhibitory reflexes are discussed individually and their nervous pathways traced experimentally. Among these are anorectal stimulation, the intestino-mesenteric reflex, the peritoneo-intestinal reflex, the intestino-pannicular reflex, distention of the urinary tract and bladder and stimulation of the motor area of the cerebral cortex and certain part of the hypothalamus. The intestino-intestinal reflex is fully described and the physiological antagonism between the inhibitory effect of this reflex and the stimulatory effect of the intrinsic nerve plexuses as brought out by distention of the lumen, is explained. Clinically there are two important points to remember about this latter reflex (1) when intestinal distention reaches pathologic level the inhibition completely counteract the local excitation and (2) repeated distentions at a given site sensitizes the reflex so that inhibition is increased.

The effects of distention of the biliary system are too important to the clinician because (1) although such distention does not effect intestinal motility, gastric motility is inhibited and tone is increased in the cardia and pylorus (pylorospasm) and (2) although distention of the bile ducts causes nausea and vomiting, distention of the gallbladder produces only nausea.

Stimulatory reflexes to gastrointestinal motility are exemplified by external reflexes via the vagi, such as those caused by stimulation of certain parts of the hypothalamus or frontal cortical area of the brain. The gastroduodenal reflex stimulated by feeding, proved to be an internal stimulating reflex, which is unaffected by bilateral vagotomy. The humoral component of nerve stimulation epinephrine and atropine are each completely evaluated. An explanation is offered, for the unexpected effect which is sometimes obtained, in that few cholinergic end organs are found in postganglionic sympathetic nerves, and adrenergic end organs are found in the postganglionic vagal nerves.

The only addition to this excellent monograph which could be suggested, is a discussion of the effect on the autonomic nervous system of the various new drugs such as tetraethyl ammonium chloride dibucaine bambaine, et cetera.

—Comment by L. J. Pope, MC U. S. N.

**Cancer of the Colon and Rectum, Its Diagnosis and Treatment**, by Fred W. R. Miles, B. A., M. A., M. D., LL. B., F. R. C. S. Surgeon, St. Joseph's and Good Samaritan Hospitals, Lexington, Ky. Clinical Professor of Surgery University of Louisville Louisville Ky. and A. Stephens Graham, M. D., M. R. C. S. Surgeon, Stuart (Irish Hospital, Richmond, Va. Associate Professor of Surgery Medical College of Virginia. 2d edition. 427 pages. Illustrated. Charles C. Thomas, Publisher Springfield, Ill. 1950. Price \$7.50.

When the first edition of this text appeared in 1939 it immediately became an authoritative reference on cancer of the large intestine. The broad experience of the authors presented in a concise yet complete manner crisscrossed by liberal review of the current opinions of other recognized authorities in the field resulted in a wide popularity among student and abdominal surgeons. Although in the interval between the first and the second edition important advances have been made in the surgical management of malignant disease of the colon, surgery for malignancy of the colon and rectum has approached state of ideal standardization insofar as the pre- and post-operative measures are concerned. Resection and primary anastomosis for right-sided and transverse lesions of the colon are recommended. The value of obstructive resection for lesions of the descending colon is urged with factory and safe and resection with primary anastomosis in this region is reserved for selected cases. The authors do not support the advocates of sphincter-saving operations for rectal cancer but state

unequivocally that no cancer of the rectum which is below the peritoneal reflection should be submitted to this procedure.

In the section on treatment the discussion of peritoneal vaccination, once popular, has been deleted and emphasis has been placed on parenteral therapy and bowel cleansing and sterilization as preoperative measures. It is emphasized that success in operations on the colon does not necessarily depend on surgical skill but is directly proportionate to the integrity of the local blood supply and the adequacy of decompression and cleansing of the bowel. The advances made in anesthesiology, the place of chemotherapeutic agents and antibiotics, and the growing popularity of the open anastomosis for all bowel resections are recognized.

The bibliography has been brought up to date.

—Col. J. R. Stauffer MC US A.

*Clinical Electrocardiography* by Francis F. Rosenbaum MD Assistant Clinical Professor of Medicine, Marquette University School of Medicine Staff, Milwaukee County Hospital Associate Staff, Columbia Hospital Adjunct Staff, Milwaukee Children's Hospital Cardiac Consultant and Attendant, Cardiac Clinic Milwaukee Children's Hospital Milwaukee Wis. Edited by Henry A. Christian, A. M., M. D. LL. D. Sc. D. (Hon.) M. A. (P., Hon. F. R. C. P. (Can.) D. R. M. (A. M. A.) Hersey Professor of the Theory and Practice of Physic, Emeritus, Harvard University Sometime Clinical Professor of Medicine Tufts College Medical School Sometime Visiting Physician, Beth Israel Hospital Sometime Physician-in-Chief, Carney Hospital Physician-in-Chief, Emeritus, Peter Bent Brigham Hospital Boston Mass. (Reprinted from Oxford Loose-Leaf Medicine with the same page numbers as in that work.) 20 pages. Illustrated. Oxford University Press New York, N. Y. publishers, 1960. Price \$4.50.

In recent years increasing numbers of books in the field of cardiovascular disease have appeared so the reader may choose here or there. In spite of wide coverage. In this group of short books on electrocardiography this work stands high. Presumably because of the limited space available for this subject in the Oxford Loose-Leaf Medicine from which it is taken certain special subjects are mentioned very briefly. Among these are unipolar limb leads, esophageal leads, and vector analysis. The student in these fields, however, will usually consult the original publications. This work covers rather thoroughly the fundamentals of arrhythmia and the patterns of myocardial infarction with adequate illustrations. The great variety of the conditions producing less specific electrocardiographic changes are discussed more briefly and again the inquirer should consult other sources if a more definitive study is being made. A book of this type is particularly valuable to the general practitioner with interest not specializing in cardiac disease.—Commander R. C. Parker Jr. MC US A.

*Surgery of the Shoulder* by Frank F. DePalma M. D. James Edward Professor of Orthopedic Surgery and Head of the Department Jefferson Medical College Philadelphia Attending Orthopedic Surgeon, Jefferson Medical College Hospital, Philadelphia Attending Orthopedic Surgeon, Methodist Episcopal Hospital Philadelphia Attending Orthopedic Surgeon, St. Agnes Hospital Philadelphia 438 pages 44 illustrations. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1960. Price \$14.00.

This book is the most comprehensive treatise on the shoulder that has been published in English. It resembles Dr. Dunnell's classic "Surgery of the Hand" in appearance and organization, and discusses in turn the evolution of the shoulder

girlie, the anatomy of the shoulder from the clinical and surgical standpoint, congenital abnormalities, the normal appearance of the components of the glenohumeral joint in each age group (stressing in particular the lesions that are compatible with good function), ruptures of the musculotendinous cuff, frozen shoulder, bicipital tenosynovitis, calcareous tendinitis, dislocations, fractures, shoulder pain of neurogenic origin, birth palsy tumors, and surgical approaches and procedures.

The outstanding feature of the book is the presentation of the results of DePalma's studies of 432 shoulder joints showing the changes that occur in the glenoid, its labrum, the capsule and musculotendinous cuff, the humeral head, and the biceps tendon in the various age groups. Of these 144 were examined after the death of patients who had been carefully interrogated and examined in their final illness for evidence of symptoms or disability referable to the shoulder and who did not give any evidence of it. These apparently normal shoulders displayed degenerative changes in the cartilage of the glenoid fossa, detachment of the glenoid labrum, partial and complete tears of the musculotendinous cuff, calcareous tendinitis, fraying and rupture of the biceps tendon, and other lesions which were formerly thought to be the cause of shoulder disability and therefore deserving of operative repair. The immediate result of this study should be a more conservative approach to shoulder disability.

Another feature is the author's study of the "frozen shoulder." He believes that any inflammatory condition about the shoulder or immobilization of the shoulder in a person over 40 may result in a tenosynovitis with adhesions of the biceps tendon in its groove producing limited and painful motion at the scapulo-humeral joint. He states that those who do not respond to conservative therapy are relieved of pain and restored to full motion by transplanting the tendon of the long head of the biceps to the coracoid process. Citing no failures, his results are truly remarkable in a condition that until now had been so disappointing to all concerned. The greatest weakness of this book is its repetitiveness. The binding and paper are excellent; the photographs, photomicrographs, reproductions of roentgenograms and detailed drawings, superb. This book is heartily recommended to all doctors who are called on to diagnose and treat pain and disability in the shoulder.—*LT. Commander W. H. Siryler MC U. S. N.*

*Indications for and Results of Splenectomy* by Fredrick A. Coffer, M. D., Alexander Blain, III, M. D., and Gould Andrews, M. D., from The Departments of Surgery and Medicine, University of Michigan Medical School, Ann Arbor, Mich. 100 pages. Illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1933. Price \$2.25.

This excellent monograph represents the results of a detailed analysis of 123 consecutive elective splenectomies for disorders associated with splenic mal-function and enlargement, performed in the period, July 1934 to July 1942. Careful pre- and post-operative studies of all patients in the series were made by the staff of the Simpson Memorial Institute for the Study of Blood Disorders, followed by close follow-up observations in every case. Most of the patients reported were classified as essential thrombocytopenic purpura (40), acquired hemolytic anemia (18), hereditary spherocytic anemia (32), and Banti's syndrome (27). The remaining 15 patients included the rarer types of splenic mal-function and enlargement such as Gaucher's disease, Felty's syndrome, splenic cysts et cetera. The general mortality for the hospital in which this work was done was 7.6 percent, compared with a mortality of 16 percent in patients whose death was directly associated with the splenic disease. Banti's syndrome showed the poorest results with an ultimate mortality of 29 percent. The results in acquired hemolytic anemia, based on the eventual mortality related to the disease,

were about the same as those obtained in Banti's syndrome, which is in sharp contrast to the excellent results in hereditary spherocytic anemia.

The authors conclude from their analysis that splenectomy offers a specific cure for essential thrombocytopenic purpura, congenital spherocytic anemia, some patients with acquired hemolytic anemia, and a few selected patients with Banti's syndrome, in addition to being of value as a procedure for the relief of mechanical symptoms caused by Gaucher's disease, splenic cysts, and splenic infarction. The authors further believe that mortality rates can be lowered by more vigorous use of transfusions in thrombocytopenic purpura, by avoidance of transfusion in hereditary spherocytic anemia during hemoclastic crises, and by earlier splenectomy in thrombocytopenic purpura (to avoid hemorrhages into the serous cavities and brain) in Banti's syndrome (before onset of hematemesis) and in congenital spherocytic anemia, as well as in acquired hemolytic anemia. Caution is enjoined as to the possibility of accessory spleens, which must be totally removed during splenectomy for splenic malfunction.

Several good diagrammatic illustrations as well as microphotographs of bone marrow and blood smears are offered, which are quite valuable in the interpretation of the lesions and the laboratory findings of the larger groups of patients reported.—*Col. D. R. Bessell, U. S. A. F. (MC)*

**When Minds Go Wrong, A Simple Story of The Mentally Ill—Past, Present and Future**, by *John Maurice Grimes, M. D.* Twenty years a psychiatrist. Four years a staff member of the Council on Medical Education and Hospitals of the American Medical Association. Author of *Institutional Care of Mental Patients in the United States*. 237 pages. Illustrations by *K. Alexandra Wille*. Published and distributed by the author, 5209 S. Harper Ave., Chicago 15, Ill., 1959. Price \$3.

This is a disputatious attack on the present system of institutional care for mental patients with vehement emphasis on the deficiencies of State hospitals. The source material is largely derived from the author's personal professional experiences in such institutions. Throughout this provocative book Dr. Grimes insists, and properly so, on the essential rights and dignity of the mental patient as a person, deploring the misunderstanding, mistreatment, and degradation that he sees him suffering at the hands of his "guards." The ward attendant, maintained in his tyranny over the patient and doctor alike by the patronage system of political bosses, is the villain of the piece. The author proposes nothing less than the complete elimination of attendants and their replacement by qualified nurses and group leaders. He contends that with attendants eliminated, political control of our State hospitals cannot exist. While to Dr. Grimes this step is the *sine qua non* of his plan, it is to be taken in conjunction with certain legal reforms, which would make way for the establishment of villages or communities of mental patients, with emphasis on rehabilitation, an approach which he considers social rather than medical.

Although the author's analysis of the problem is oversimplified, his proposed remedies deserve thoughtful consideration. Some have already been tried with varying degrees of success. Some are of debatable value, others will inevitably be impossible of realization, at least until such time as human frailty is more sharply confined to those now called patients.

The book has a table of contents, but no index or bibliography.

—*Lt. Col. W. J. Barker, MC, U. S. A.*



**The Clinical Use of Radioactive Isotopes**, by *Bertram V A Low-Beer M D*  
Associate Professor of Radiology University of California Medical School,  
San Francisco, Calif. Publication Number 54, American Lecture Series.  
414 pages. Illustrated. Charles C Thomas, Springfield, Ill., publisher  
1950. Price \$9.50.

This comprehensive volume comes at a time when it is well to summarize and consolidate the voluminous literature on the subject of isotopes. More than 400 references to scientific literature are quoted covering the period of 1930 to 1949. Physics comprises about one-fourth of the pages and is written in language which should be intelligible to the average physician. Wisely the author has chosen to emphasize the vast and complicated new information which must be mastered before the isotopes can be understood. Relatively few pages are devoted to the therapeutic phases of the problem. Isotopes have been used in the treatment for many diseases. These are enumerated and an evaluation of the results is recorded. In general, this new source of internal radiation has not been more valuable than the older external sources. The brightest pictures are being painted with radio-phosphorus for polycythemia vera, radio-iodine in disease of the thyroid, and radio-cobalt as a substitute for radium.

Most of the book is devoted to clinical investigation of the isotopes. In the latter sections, the author discusses each isotope under the following headings: (1) mode of production, (2) biochemical properties, (3) uptake in various organs and systems of the body, (4) modes of excretion, (5) metabolism, and (6) radiation effects. The space devoted to each of the above is limited by the incompleteness of our present knowledge. Radio-phosphorus, -iodine, -sodium, and -cobalt are extensively covered and radio-iron, -arsenic, -mercury, -manganese, -gold, and -zinc less so. One is again impressed by the fact which has been frequently expressed, that the investigative use of the isotopes as tracers is much more promising than their use as therapeutic agents.

—Col. H DeYoung MC U S A.

**Bone and Joint Diseases, Pathology Correlated with Roentgenological and Clinical Features** by *J Vernon Lusk M D (Ortho.) M D, F A C S, F L C S*  
Assistant Clinical Professor of Orthopedic Surgery University of Southern California. Senior Attending Physician, Department of Orthopedic Surgery and Consultant in Orthopedic Pathology Los Angeles County Hospital. Member Executive Committee in Orthopedic Surgery National Research Council. Member Board of Associate Editors, Journal of Bone and Joint Surgery. 614 pages. Illustrated. Charles C Thomas, Publisher Springfield, Ill. 1950. Price \$16.50.

This book is a welcome addition to medical literature. It comprises in one volume information that was formerly contained in two or more volumes. The author has accomplished his purpose in attempting to correlate the pathologic anatomy with the associated roentgenologic and clinical findings in diseases of bones and joints. The book is well organized, beginning with a chapter on the normal skeletal system and in each succeeding chapter discussing a separate phase of bone and joint disease. The subject is first presented from clinical standpoint, followed by a discussion of the anatomic pathology, pathogenesis, and a roentgenologic and clinical correlation. The presentation of diseases of bones and joints is comprehensive. The material has been well chosen so that the reader can acquire good concept of the subject without reading through numerous details which concern only the investigator. The reader is made aware that the disease under discussion is a dynamic process. This is especially true in the chapter on osteomyelitis and the arthritides. Presented in this manner

the material is a valuable aid to diagnosis and treatment. There are ample references at the end of each chapter. There are numerous illustrations both in black and white and in color all of which are very good. This book will be of greatest interest to orthopedists, pathologists, and roentgenologists, but is also recommended to all physicians and surgeons who have occasion to treat bone and joint diseases.—*Commander R. B. Johnson MC U S N*

**Neurosis and Psychosis**, by *Beulah Chamberlain Bosselman, M. D.* Associate Professor of Psychiatry University of Illinois College of Medicine Chicago, Ill. foreword by *Francis J. Gerty M. D.* Professor of Psychiatry and Head of the Department, University of Illinois College of Medicine, Chicago, Ill. 172 pages. Charles C. Thomas, Publisher Springfield, Ill., 1930. Price \$4.50.

This attractively bound little volume has been written to provide the medical student with a textbook on general psychiatric orientation. This it does in a readable and yet relatively comprehensive manner. In general the author progresses from the simpler to the more complex conditions. She has achieved excellent continuity by tracing successive degrees of ego dysfunction or disequilibrium, as she calls it, through the various progressive involvements. I was impressed by the unobtrusive yet highly effective manner in which the author has introduced historical data. For the more interested student the footnotes are replete with suggested reading. This book is not only highly recommended for its original purpose but also for instruction of nurses and social service workers, and as a refresher for the general practitioner.

—*Lt. Col. H. D. Wilkinson, MC U S A.*

**Diagnosis and Treatment of Tumors of the Head and Neck (Not Including the Central Nervous System)** by *Grant E. Ward M. D. D. Sc., F. A. C. S.,* and *James W. Hendrick M. D. M. R.,* From the Departments of Surgery of the School of Medicine University of Maryland, and the Johns Hopkins University School of Medicine, and the Oncology Clinic of the University Hospital and the Tumor Clinic of the Johns Hopkins Hospital. 84 pages illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1930. Price \$15.

This is an excellent book from the standpoint of the otolaryngologist and head and neck surgeon. It covers the subject of tumors of the head and neck from the clinical viewpoint better than any other volume I know of. Following a brief introduction there is a well written, beautifully illustrated chapter on the early development of the head and neck. The next 4 chapters discuss benign, pre-malignant and malignant lesions of the skin of the head and neck, and of the lips. Tumors of the mouth, jaws, salivary glands, tonsils, pharynx, base of the tongue, nose and paranasal sinuses, eye and adnexa, ear and larynx are described in order by sequence using the authors' wide clinical experience as well as the experience of their well-known colleagues in Baltimore as the basis for discussion. The chapters dealing with tumors of the neck are especially well done. Treatment of the various benign and malignant lesions is well covered throughout. Irradiation, surgery, mustard gas therapy and electrosurgery are extensively considered. Surgical technique is described in detail in many instances. The text is profusely illustrated with drawings, black and white photographs, and many color plates. This book should be available to all surgical and otolaryngologic residents, and would be a welcome addition to the library of any oncologist.

—*Capt. A. J. Delaney MC U S N*

This book is a reliable laboratory reference. In keeping with its editorial policy the technical procedures presented are those considered most generally useful by the specific author involved. The wise selection of authors for each subject and the able editing by Dr. Ralph S. Muckenfuss, Chairman, Subcommittee on Diagnostic Procedures and Reagents, American Public Health Association has resulted in a concise laboratory manual that will be found to be *extremely useful to all technical workers engaged in diagnostic work in the field of communicable diseases exclusive of the virus and rickettsial agents.* Although it is ably presented, one wonders why the technique for Rh testing is also included in this manual.—*Col W. B. Stone, MC U. S. A.*

**Pharmacological Basis of Penicillin Therapy** by *Karl H. Boyer* Ph. D. M. D., F. A. C. P. Director of Pharmacological Research, The Medical Research Division, Sharp and Dohme, Incorporated, Glenolden, Pa. Publication No. 77 American Lecture Series, 214 pages illustrated. Charles C. Thomas, Publisher Springfield, Ill., 1950. Price \$4.50.

This monograph presents the pharmacology of penicillin including the author's own ideas and a comprehensive review of the literature with excellent bibliographies at the end of each chapter. The importance of the subject to the medical profession is stressed by a statement that in 1948 the combined sales of penicillin and streptomycin was 60 percent of the total dollar sales of all medicinal products. Penicillins alone accounted for little less than half the total dollar sales of all drugs. At least 5 penicillins are known, all of which are substitutions of the  $\beta$ -lactam structure. Penicillin-G the benzyl ester is the most stable and has the highest antibacterial activity in vivo. Penicillin is rapidly eliminated by the kidneys when given intravenously but is poorly absorbed after oral administration. In most persons an oral dose 5 to 10 times the intramuscular dose is required to obtain the same serum levels. The loss by oral administration is accounted for by combination of poor absorption and destruction of penicillin by penicillinase elaborated by the intestinal bacteria. Acid activity of the stomach has a minor role in the relative ineffectiveness of penicillin given by mouth. Penicillin is toxic to human beings through sensitivity of the allergic type and lowering of clotting time but in guinea pigs massive doses have caused total necrosis of the adrenal glands.

After the parental administration of penicillin, it is rapidly distributed throughout the extracellular fluid and concentrated in some organs, particularly the liver and kidneys. Diffusion of penicillin through boundaries of body cavities or fluid containing spaces is limited but increased by inflammation. Penicillin is both bacteriostatic and bactericidal. Both these effects are caused by the ability of penicillin to inhibit the assimilation of glutamic acid by organisms that do not make but require preformed glutamic acid for growth (gram-positive organisms). The concentration of penicillin determines whether this effect will merely inhibit growth or actually kill the organisms present. This fact is important to the clinician in deciding on the relation of depot penicillin dosage and large doses of the water soluble solutions. The problem of maintaining maximum concentrations of penicillin has been attacked more or less successfully by adjuvant drugs (caronamide and benemid) which compete successfully with the penicillin in kidney excretion. In addition, benemid appears to be less toxic and more truly an adjuvant drug than caronamide.

—*Col. W. D. Preston, U. S. A. F. (MC)*



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# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
Agency, Department of Defense*



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THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY  
THE DIRECTOR OF THE BUREAU OF THE BUDGET OCT 19 1949

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON, 1951

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

The Chairman of the Armed Forces Medical Policy Council and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy and Air Force to submit manuscripts for publication in this JOURNAL.

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*United States Navy*

WAYNE G. BRANDSTAAT, *Associate Editor*

*Colonel, Medical Corps*

*United States Army*

ROBERT J. BENEFIELD, *Associate Editor*

*Colonel, Medical Corps*

*United States Air Force*



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OFFICE OF THE SECRETARY OF DEFENSE  
WASHINGTON 25, D. C.

**MEMORANDUM: Personnel of the Medical Services of the United States  
Armed Forces**

When Chinese Communist forces poured into North Korea during the last part of November and early December, the air evacuation system of our Armed Forces faced its stiffest test. The record is almost amazing: More than 14,000 patients were flown out of Korea to Japan in one eight day period. This gigantic airlift for the sick and wounded was carried out in an extremely grave tactical situation in the face of overwhelming enemy strength.

The air evacuation policy established in the Department of Defense in September, 1949 provided the Armed Forces with large scale organization in being when South Korea was invaded -- an organization geared to match modern military concepts of speed, size and distance. From that time, air evacuation has removed thousands of sick and wounded from forward areas to Japan and the United States in the shortest time and the best condition ever witnessed in any American military operation.

For this remarkable record, the nation's thanks go to those many men whose foresight, faith and vision in the field of aeromedicine provided the machinery for this work when it was needed; to the flight surgeons, flight nurses, technicians, the air and ground crews and others who labored around the clock to make it work; and to the patients themselves, whose fortitude frequently was an inspiration to all concerned.

But let us remember too that this was joint medical-military enterprise in which the Military Air Transport Service, the Air Force, Navy and Marine Corps fused their men, their planes, helicopters and equipment into a highly coordinated operation. We have seen demonstration of cooperative team work in the best American tradition.

Richard L. Hedding, M. D.  
Chairman, Armed Forces Medical  
Policy Council

# UNITED STATES ARMED FORCES MEDICAL JOURNAL

Volume II

February 1951

Number 2

## Facial Wounds in Korean Casualties

BERNARD N. SODERBERG, Colonel MC U S A

**I**N THIS article, we present some of the first war casualties from the Korean conflict having wounds about the face mouth and jaws. These patients illustrate the severity of the lesions sustained and are comparable to that of the deformities treated in World War II. A review of the surgical treatment of this type of lesion from the front line through the Zone of the Interior should be of value and should enable the plastic and maxillofacial surgeon to standardize methods of procedure.

### CASE REPORTS

*Case 1*—This patient sustained a destructive wound of the lower jaw. There was soft tissue avulsion as well as fragmentation of the mandible with loss of its continuity on the left (fig 1). The treatment consisted of intermaxillary fixation with rubber band traction, oral hygiene and the removal of nonvital teeth. Debridement of a radical nature was contraindicated. In order to remove foreign material which would interfere with healing the patient will be watched and checked with roentgenograms. As soon as the wounds are completely healed there will be local revision of the soft tissue and mandibular reconstruction by bone graft.



*Figure 1—Case 1. Deformity of the jaw manifested by soft tissue avulsion, lip distortion, mandibular bone deletion, and labial sulcus destruction.*

**Case 2**—On admission to this hospital 10 days after injury this patient presented a large wound located in the left cheek (fig 2)



Figure 2.—Case 2. Soft tissue loss of the cheek with a through-and-through hole into the oral cavity. A portion of the aneurysm is visible in the center.

sary to improve contour. Facial fascial paralysis.

**Case 3**—This patient was hit by an enemy rifle bullet on 31 July 1950. The missile entered at the angle of the left mandible, passed through the face, and left beneath the right eye (fig 3). As a result the patient sustained a compound fracture of the angle of the mandible on the left with an associated fracture at the symphysis and a compound comminuted fracture of the right maxilla. He was treated with continuous intermaxillary multiple loop and rubber-band fixation. The concave contour cheek defect resulted from loss of maxillary architecture and soft tissue. The scar was of the multi-

Extensive soft tissue loss was present with a through-and-through hole into the oral cavity. There was an associated compound comminuted fracture of the left maxilla and a fracture of the ramus of the mandible with exposure of the fractured segment. The treatment consisted of through-and-through wound irrigation with continuous wet dressings to the granulating area. As soon as the recipient site is ready a skin graft will be applied. The nonviable bone of the mandible will be removed and eventually local revision of cheek soft tissues will permit closure. A derma fat graft may be necessary. Transplants will compensate for



Figure 3.—Case 3. Multiple cicatrices with resultant lid and lip deformities.

ple stellate type and extended from the lower eyelid to the lateral commissure on the right. There was splaying out of the nasal bones with an associated destruction of the inner canthal ligament. Our primary objective was to reconstruct the bony architecture. When all reaction in the soft tissue has subsided a modified rhinoplasty will be performed to obtain an airway on the right. Subsequent local soft tissue revision will permit the descent of the upper lip. Following the soft tissue revision, a bone graft to the orbital rim can be performed with an additional soft tissue transplant for reconstruction of cheek contour. A reattachment of the intercanthal ligament will also be attempted as a definitive procedure.

*Case 4.*—This patient sustained a shell fragment wound of the jaw. The patient apparently had a radical debridement before being returned to the Zone of the Interior (fig 4). On admission the soft tissue wound was almost completely healed. The roentgenogram revealed a loss of almost all the mandible from the symphysis to the angle. There were also a number of foreign bodies in this area which might explain the two small draining sinuses which were present. This patient had intermaxillary rubber band fixation of the remaining teeth. This elastic traction permitted some mobility and at the same time kept the left mandible in proper occlusal position. If this splinting had not been done the floating fragment would eventually have become medially deviated and would have had to be corrected prior to bone graft by glide splint and intraoral fixation with bar and acrylic saddle. The short ramus fragment on the right impinged on the occlusal surface of the upper maxillary teeth. Because bone grafting was not to be accomplished for at least 6 months this fragment will not be disturbed. Eventually external traction to the angle will mobilize it into proper place. After this has been accomplished the position will be maintained by an intraoral splint. An alternative plan would be to eliminate external traction on the short right fragment just before operation and depend on surgical skill to mobilize this segment at the time of bone grafting.



Figure 4.—*Case 4.* The contour contour in this patient was caused by loss of intra- and extra-oral soft tissue as well as one-half of the mandible.

One would then rely on fixation of the graft to the fragment to prevent the posterior kick-up tendency. This method, although satisfactory in some patients, offers less stability than is allowed by the addition of the intraoral appliance.

*Case 5.*—This patient had extensive loss of the right cheek and maxilla (fig. 5). The depressed wound extended posteriorly across the palate to the pterygoid plate. Some filaments of the second division of the trigeminal nerve seemed to be partially exposed in the roof of the antrum. The facial nerve was involved. The anterior wall of the maxilla was completely destroyed. Adequate intranasal drainage for the exposed antral area will be established. After this has been accomplished the soft tissue of the cheek wound can be closed without a pedicle flap. Eventually facial transplants from the thigh will balance the oral commissure on the right.



Figure 5.—Case 5. The deep hole in this cheek extended across the palate to the pterygoid plate.



Figure 6.—Case 6. Loss of the lower lip and the lower portion of the upper lip.

*Case 6.*—This patient sustained a severe injury of the mouth, a result of being struck by fragments of a hand grenade. There was loss of the lower portion of the upper lip and a complete loss of the lower lip including both commissures (fig. 6). Intraorally the buccal and labial sulci were destroyed with avulsion of a portion of the alveolar process. There was also a fracture of the maxilla and multiple compound fractures of the mandible. This patient also had a compound comminuted fracture of the right radius and left humerus.

## JAW AND MOUTH RECONSTRUCTION

A discussion of the methods of surgical reconstruction of the mandible and allied soft tissue is important not only because of the similarity between the problems of the present and past war but also because of its continuous applicability to service and civilian traumatic maxillofacial injuries. The reparative procedure in major losses of jaw mouth and soft tissue architecture may be divided into four phases: fragment control, bone grafting, intraoral soft tissue restoration and cosmesis.

In World War II the early front line treatment of the fractured mandible, with or without bone loss, fixation by splinting was indicated as soon as the patient's general physical condition had become stabilized. When sufficient teeth were present all methods of fragment control were contraindicated except intermaxillary fixation by means of ligatures or rubber bands strung between continuous multiple loop fixation wires firmly attached to the teeth. Through and through bone wiring for fragment control when performed by inexperienced personnel resulted in rotation distortions, necrosis around the wires, and unnecessary compounding of the bone as seen in the World War II casualty shown in figure 7. The external pin fixation method was also sometimes poorly handled (fig 8) indicating that it should rarely be attempted except by experts, and then only when insufficient teeth are present. External pins do not always hold securely and cannot be considered practical as front line procedures. They loosened in the bone



Figure 7.—Front-line treatment such as this is contraindicated.



Figure 8.—The treatment of this World War II casualty showed poor mechanical sense.



permitting undue fragment mobility and unless aseptically inserted caused scar dimpling of the face which sometimes resulted in permanent soft tissue deformity. If the mandible was edentulous, circumferential wiring about a superimposed form fitting splint, therefore became the most satisfactory method for general use.



Figure 9—Roentgenogram of patient shown in figure 8.

In the early care when bone loss occurred near the angle of the mandible with the resultant posterior lock-up, immediate fragment control was a problem. For this reason many front line surgeons attempted to devise all kinds of apparatus. Many tried in World War II were useless some caused more harm than good. Simple planting of jaw to jaw was sufficient. No attempt should be made to control the posterior edentulous fragment when lateral losses necessitating bone graft are present unless a transplant is anticipated within the succeeding 3 months (fig 9). The anterior superior displacement of the ramus fragment does not interfere with the mechanics

of occlusion during the preliminary period, and it can be more advantageously cared for later.

#### DEFINITIVE FRAGMENT CONTROL FOR BONE GRAFTING

We have had obvious problems in definitive surgical control of edentulous fragments with associated lingual labial and hyperoccluded fixation. To deal with these situations combinations of several techniques have been useful. Modified orthodontic principles, using intraoral rubber band traction, together with continuous extraoral support have been successful. The head cast with contained armature and the parallel posterior side bar when indicated, are effective in preparing the operative field for the subsequent bone inlay. These techniques are regulated by intraoral splinting to maintain the position of the new fragment. Holding the edentulous area in position with the intraoral acrylic or silver saddle has been satisfactory (fig. 10). Untoward ulcerations or necrosis of the alveolus from saddle pressure can be avoided by instituting proper field preparation and using saddles constructed with broad surfaces and rolled edges. An example of this use is found in patients in whom one mandibular side

has teeth and there is a posterior edentulous angle fragment with loss of the mandibular body on the opposite side. In such a situation it would be well first to use a flange glider splint on the occlusal side. Articulation gradually mobilizes the tooth fragments into proper relationships. When this is achieved the maxillae are fixed by a lockbar metal splint. The edentulous segment is then handled by external traction. The new position is maintained by the attached intraoral saddle block. This method of stabilization prepares the bed for the bone graft. It is superior to external fixation during the transplant period because in this latter method there is a marked tendency to graft joint wobbling and a concomitant nonunion.

The flange saddle has been valuable in maintaining the position of the fragment in patients in whom the anterior symphysis area loss and edentulous lateral body with its mesial swing resulting in the bird face deformity necessitated osteotomy and circumferential wire traction to restore primary arch position. With the problem of an edentulous maxilla and loss of continuity in the body of the mandible with an edentulous posterior fragment control sufficient for a successful graft can be achieved by a combination of intra- and extra-oral fixation. A metal splint and posterior saddle is constructed for the mandible. A properly fitting denture for the edentulous maxilla is made and held in place by strut wires passed through the cheek to metal armatures incorporated in a plastic head cast. When both mandible and maxilla are treated in this manner the jaws can be locked together. Stabilization is then sufficient for good results. When the lower jaw is completely edentulous, with loss of continuity and a few teeth remain in the maxilla combined intra- and extra-oral fixation can again be used. Here external splinting is used for the mandible. The fragment position is maintained by Roger Anderson pins. A bar splint attached to the remaining maxillary teeth allow the upper jaw to be locked by bar armature to the Roger Anderson compound. The arrangement has seemed to improve



Figure 10—Roentgenogram showing the intraoral appliance used for stabilization during the period following the bone transplant. This is a Zone of the Interior procedure.

stability. With both maxilla and mandible edentulous, combinations of these two methods may be considered. If lock pins are to be used, they should be inserted in the denser parts of the bone. This will give maximum grip firmness. In the posterior position of the mandible, for example they could be fixed in the external oblique line. Here the cortex is dense and the pins would have to penetrate 0.5 cm. or more to get through. In this way unnecessary compounding of cancellous bone may be avoided.

Ordinarily if external traction does not mobilize and reposition the fragment in 2 or 3 weeks, an operation is indicated to free the adherent area. In some patients, immediate bone graft without de-cortication may be employed. The position is maintained by firm graft wiring alone. Great care in wiring the ramus fragment is imperative to prevent disturbance of graft attachment by tissue motion during the subsequent swallowing processes.

The cap metal splint method has given good results but these splints have sometimes slipped off the teeth resulting in serious complications. The sectional metal splint is believed to be superior to the complete inclusive cemented type. Failure of the latter to hold results when the cement with its added bulk does not exactly fit the tooth to the splint. The sectional metal splint is in many cases superior since it holds securely and is locked by a simple wiring technique. With this method there is no slipping and there is the added feature of easy removal thus facilitating cleanliness.

#### TRANSPLANTATION TECHNIC

The choice of anesthesia in bone grafting of the jaws depends on the availability of trained personnel. With two surgical teams the operation can be completed more rapidly and without the use of general anesthesia. One team prepares the recipient site while the other obtains the graft material. In this circumstance nerve block and spinal anesthesia are adequate. Intratracheal gas-oxygen-ether might be preferred when defects are large or complicated and when one surgeon must perform both operations. Preoperative roentgenograms and clinical examination indicate the size of graft required. Fragment exposure, adequate mobilization, and excision of eburnated bone ends determine the actual amount. Not infrequently what has appeared primarily as a small defect becomes of major proportion when one has finished rongeur-ing away fragment ends to reach good bleeding bone. This is especially true when intermediate attached fragments have been allowed to remain in the jaw. These even though they attach to one or the other of the fragment ends may not be sufficiently vascularized throughout to insure union of the graft and may at operation,

have to be removed. If the prepared graft is a little too short to span the defect it can be split and the sections slipped enough on each other to fill the gap but still be overlapping. When this is necessary the volume of the transplant may be insufficient. Under such conditions bone chips without cortex should be packed beneath the graft.

Preparation of the soft tissue between the fragment ends is important. Good circulation is essential not only for the graft at its attachments to the mandible but also from the immediate soft tissue contacts. Fibrosis like eburnation prohibits proper take and permits graft absorption. Recipient sites freed of fibrotic induration are soft and supple. Such tissue falls into close approximation to the graft. Apposition prohibits serum and blood accumulations and insures a rapid vascularization. If the oral mucosa is penetrated in preparing the soft tissues, the transplant should not be performed because chemotherapy and antibiotics do not always prevent subsequent infection of the graft. It would be better to revise the immediate soft tissues on the medial aspect to increase the bed thickness adjacent to the mucosa and consider the operation a soft tissue bed preparation. The success of subsequent bone grafting should then be more certain.

Cancellous bone is the preferred graft material. This is obtained from the wing of the ilium. To obtain the transplant an incision is



Figure 11—Roentgen gram of iliac transplant that has been in place 3 months.



Figure 12—Roentgenogram of same transplant after 1 year. The angle of the mandibular transplant was formerly the anterior superior spine of the ilium.

made over the border of the iliac crest extending posteriorly from the anterior superior spine. Retracting the soft tissue and muscle exposes the periosteum. This incised and elevated, completes the bone exposure. The avoidance of marginal periosteal shredding in the process will materially reduce postoperative spur formation. With proper bone exposure crest and wing sections can be removed. The anterior superior spine is sometimes used when there is loss of the angle of the mandible. This transplant is inverted in the recipient site (figs. 11 and 12). The lesser spine may be also incorporated when there is a combined loss of continuity involving body angle and ramus shaft. Care should be employed in graft removal. In this process, sometimes, an associated seeding of the adjacent soft tissue occurs. These bone cell deposits however may disappear with the passage of time. Wound closure follows fundamental surgical principles.

#### POSTOPERATIVE SEQUENCE

The postoperative treatment consists of continuous fragment control until union occurs. This is followed by intra- and extra-oral soft tissue revision for completion of the reconstruction. The duration of splint fixation varies with the size and location of the grafted defect. Ordinarily small grafts must be fixed for 8 weeks. When larger transplants have been used this interval may have to be prolonged. Failure may occur if graft immobilization is improperly carried out. Absorption and fracture have been noted in long transplants, located between fragment ends with teeth when fixation has been removed too soon. Other failures have occurred when the roots of adjacent teeth have become infected because of neglect during early care prior to transplant. These infected roots contaminating a graft end, result in osteomyelitis and sometimes complete loss of the graft. A preoperative roentgenogram of all teeth is necessary not only for this reason, but also because a flare-up in a nongraft area may be confusing and more difficult to treat if it occurs coincident with the early postoperative period.

It cannot be too strongly emphasized that, after splint removal examination for evidence of clinical mobility must be carried out repeatedly. If areas of functional stress or strain are carefully watched iterations in continuity can be detected in their inception. Splint maintenance may be required up to 6 months, interval unlocking being possible only after 12 weeks.

After mandibular continuity has been established intraoral reconstruction is begun. Soft tissue loss in this area can be compensated by local revision or by soft tissue additions from external sources. If additional soft tissue is required, skin grafts may be used. When buccal and labial flaps have been obliterated extensions can be accomplished

by using dermatome grafts. Bed apposition can be maintained adequately with either of two techniques. Dental compound, covered with skin exactly fitting the recipient site and sutured in place may be sufficient. Intraoral splints with attached silver baskets holding the surrounding dental compound to the contour of the deformity are also effective. The latter technique may be preferred by those who believe graft contraction is best overcome by a postoperative distention acrylic conformer. The square bar sliding principle, in the splint construction for maintenance of the position of the conformer is now believed to be superior to the screw lock method. The slide bar is efficacious, is easily removed for cleaning and is less apt to get out of order. Splints with screws are more difficult to manage. They are time consuming and thread stripping may occur putting the apparatus out of function until it can be rebuilt. Stout has shown the sleeve slide principle to be advantageous if a large number of patients are to be treated.

If there are tip or lateral tissue losses of the tongue free skin grafts can also be used. Their purpose here is to supply adequate surface coverage to the raw area formed after the impeding fibrosis has been dissected away. To insure the skin graft taking it may be fixed by stent. The usual border sutures tied securely over the summit of a firm, form fitting material have been sufficient. Intraoral lateral cheek losses have been treated similarly. The skin takes well and the mobilization offered facilitates function.

The tube pedicle used for intraoral reconstruction is applicable in extensive repair of the palate. When the extent of the loss precludes repair by the local rearrangement of tissue the tube formed on the external body surface, may be brought into the mouth and grown to the remaining margins of the palate producing a permanent separation between the nasal and oral cavities. The arm is the most feasible source for transplant material. The tube end to be inserted into the mouth, has its raw surface skin grafted before migration. In situ time for this graft if prolonged prior to oral attachment allows maximal adjustment of the free graft. Doming of the transplant caused by contraction of the free graft is less likely to occur after the transplant is in place. Both direct and indirect arm tubes are successful.

The last stage of jaw reconstruction deals with the external appearance of the repaired area. When pedicle transplants have been required to supply a soft tissue bed for bone graft reception skin surface replacements of the transplant can be made by a variety of plastic methods used to mobilize adjacent cheek, chin and neck tissue over the transplanted subcutaneous tissue. Foreign skin as free graft or pedicle rarely matches adjacent face skin, hence, the cutaneous sur-

face of the transplant is largely excised. Its complete removal is advocated. Facial tissue shifts, as migrated flaps usually are successful. Their use depends on tissue availability and previous scarring. In addition to free skin grafts and pedicle flaps direct transplants of fat and derma have been of value. In the jaw area, if there are no bone losses or if successful continuity repairs have been achieved, the contour can be improved with this method. The abdomen is used as the donor site. The epidermis having been removed by a dermatome, the derma and fat can be lifted out and carried directly to the jaw area. If the adjacent skin of the recipient site is adequate undermining for mobilization permits its closure without tension over the transplant. Fat absorption when derma is attached and turned inward is less than when fat alone is employed, but, when the transplants are reversed in the recipient site the possibility of subsequent cyst formation in the deeply unbedded derma must be kept in mind. Sometimes one is confronted with an already formed abdominal tube and an associated facial defect reparable by the above means. In this situation, if the tube is of sufficient size it can be reopened. With adequate border tension the surface epithelium is removed the remaining derma and fat can then be used. This eliminates the intermediate carrier stage and the subsequent operations incident to this type of repair.



# Acute Suppurative Arthritis of the Hip

## Report of a Case

ROBERT H. HROZEN, *Captain U S A F R (MC)*

OLIVER K. NIESS, *Colonel U S A F (MC)*

A CAREFUL review of the literature of the last 10 years fails to produce more than a few articles dealing with septic arthritis of the hip joint. This would suggest that this disease is relatively uncommon today and that the probable reason for this is the early use of modern chemotherapeutic measures in infection. Nevertheless, this serious entity still occurs occasionally and the importance of early and adequate treatment cannot be overemphasized.

### ETIOLOGY

Badgley and coworkers,<sup>1</sup> Slowick,<sup>2</sup> and Nicholson<sup>3</sup> have studied large series of cases and have found the causative organism to be either staphylococcus or streptococcus in almost all instances. Occasionally pneumococcus, gonococcus, or some other organism is responsible. Many times a definite predisposing lesion can be demonstrated although Slowick had no explanation for the cause in 13 of his 60 cases. Infections of the upper respiratory tract, superficial lesions and distant foci of osteomyelitis are the most common sites of origin.

### PATHOLOGY

It is probably best to classify the disease either as a primary purulent arthritis or as one in which there is a secondary focus of osteomyelitis. In the first involvement is centered in the synovium, neck

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1. In: *Hospital & Laboratory Force Base Denver, Colo.*

Badgley, C. E., Taylor, L., Pearson, W. R., and Burton, C. H. Study of end results in 117 cases of septic hip. *J Bone & Joint Surg.* 18: 194, 1951 Oct. 1956.

2. WICK, F. A. Purulent infections of hip joint: analysis of 60 cases. *New England J Med* 212: 67-676, Apr. 11, 1933.

3. NICHOLSON, J. T. Septic arthritis of hip: treatment by immobilization. *Pennsylvania M J* 42: 840-854, Apr. 1946.

4. WINTER, D. R. Pathology and treatment of pyogenic arthritis. *Pennsylvania M J* 32: 62-67, Nov. 1928.



of the femur epiphysis, or innominate bone adjacent to the acetabulum. The surrounding bony structures fail to demonstrate any immediate significant gross changes. Soon destruction of the joint structures occurs with erosion of the cartilage and surrounding bony areas. Radiologically this is characterized by a narrowing of the joint space followed eventually by distinct and widespread bony damage leading to dislocation of the head of the femur. In the secondary type when a focus of osteomyelitis is established, there are early changes characteristic of this disease in the region of the neck of the femur. There does not appear to be any area of true epiphyseal destruction. In Slowick's group of cases, there was not a single instance of streptococcus being involved in the secondary type.

### SYMPTOMS AND DIAGNOSIS

Most of these cases occur among the very young age group. As a result, it is expected that the symptoms may vary somewhat with the age. Pain in the hip joint is the first sign and a limp quickly results. These patients have a septic type of temperature often reaching 104° F. This is accompanied by a moderate leukocytosis. A deformity in flexion, adduction, and internal rotation follows. Any attempt to maneuver the leg causes exquisite pain.

It is the general belief that early aspiration of the hip joint is important in diagnosis as well as in the relief of pain caused by the distended capsule. The differential diagnosis is difficult only at the acute onset of the disease. Tuberculosis, bursitis, acute poliomyelitis, inguinal adenitis, traumatic synovitis and other injuries, and primary epiphyseal disturbances should be considered.

### TREATMENT

Prior to the advent of the sulfonamides and the antibiotics, treatment of acute diseases of the hip was limited to incision and drainage which, with few exceptions, had to be considered imperative. Several approaches for such treatment both early and late, have been described. All of them accomplish the same basic purpose of opening and draining what is essentially an abscess. The generous use of sulfonamides and antibiotics probably makes it possible

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- CHESTNUT L. K. Roentgen signs of early septic arthritis of hip in infancy  
*Radiology* 7:66 4 June 1912
- REID C. G. R. Acute pyogenic arthritis of hip: operation giving free access and  
 efficient drainage  
*Lancet* 419-42 A1 2, 1942
- C. A. P. Differential diagnosis of "painful hip" in childhood  
*Am J Surg* 54 609-612 Dec 41
- HARRIS P. H. Radical treatment of residual deformity from septic arthritis  
 of hip occurring in young children. *J Bone & Joint Surg* 34 57-62, July 1942.

to avoid draining in many cases. Although there is little literature\* discussing the use of penicillin and other similar drugs in these cases, there is no doubt as to their indication. The following plan of treatment is therefore suggested (1) early and repeated aspiration of the joint as necessary with instillation of penicillin solution at each aspiration (2) administration of large amounts of sulfonamides and other antibiotics (3) incision and drainage of the joint if the patient fails to make a rapid response to the foregoing measures (4) absolute rest with the usual symptomatic treatment designed to combat the intense systemic reaction which these patients experience and (5) immobilization.

There is some question as to whether splint and traction methods are as satisfactory as the use of a plaster spica. Any type of splint or traction is somewhat difficult to maintain, but with adequate nursing care and careful attention the desired results can probably be achieved. This is more comfortable to the patient than a plaster cast and permits physiotherapy to the leg distal to the hip if indicated.

#### CASE REPORT

A 30-year-old man was first admitted on 1 May 1949, complaining of severe pain in the right hip joint that had caused him to collapse 2 hours before admission. He had been hospitalized for 13 days at another hospital 7 weeks previously because of a moderately severe upper respiratory infection at which time he had transient discomfort in the hip joint. The systemic review was otherwise negative and all the physical findings were limited to the right hip joint. He maintained the thigh in flexion and adduction with internal rotation. He was acutely ill and had excruciating pain on all hip motion. There was about 30 percent limitation of motion because of muscular resistance. His temperature was 102° F. The white blood cell count was 20,000 and the sedimentation rate was 30 mm. (Wintrobe). The initial and subsequent blood cultures as well as examination of the urine were negative. Roentgenograms of the pelvis and chest were normal.

He was confined to bed and given supportive treatment in addition to large doses of penicillin and sulfadiazine. Chemotherapy was discontinued after 10 days. During the last 4 days of treatment his temperature was normal. Three aspirations of the joint yielded from 60 to 120 cc of thick sterile pus. Aspiration of the joint gave much relief from symptoms.

On the fourteenth day he had a low grade spiking temperature, and chemotherapy was resumed and continued for a more week. During the last 9 days he was afebrile. At the end of the third week,

because of an increase in his leg deformity traction was applied with the leg in extension, external rotation, and adduction. This was maintained until the end of the sixth week. Serial roentgenograms were taken throughout the course of hospitalization and demonstrated progressive joint changes starting about the eleventh day. At the end of the sixth week, physical therapy was begun, and the patient was given hot tub baths and allowed mild activity in a wheel chair. In the eighth week, under pentothal sodium anesthesia, the leg was gently manipulated and a full range of motion without restriction was obtained.

At this time an ischial weight-bearing brace was applied and the patient returned to his school. On 15 September he could bear full weight on the leg and had full range of motion and no symptoms. A follow up 10 months later demonstrated some joint changes but he had full range of motion and only occasional mild pain in the hip on long standing or walking.



# A Combination of Tar and Antihistaminic for Local Use<sup>1</sup>

JOHN D. WALTERS, *Commander MC U S N*

ROBERT L. GILMAN, *Captain MC U S N*

FOR many years dermatologists have used coal tar or its derivatives in treating various types of dermatoses. It is considered of particular value in chronic scaling and pruritic conditions and is usually well tolerated. Within the past few years the antihistaminic compounds have been used locally for the relief of pruritus with good results in many instances.<sup>2,3</sup> There are reports citing examples of sensitivity to antihistaminic compounds ranging from 1.3 to 6 percent.<sup>4-6</sup> In the main reactions do not appear to be common. Recently we undertook a clinical trial of a compound (lutar) containing 5 percent coal tar extract and 2 percent antihistaminic compound (pyranisamine maleate) in a hydrophilic base.

A total of 52 patients was followed. Previous treatment had extended over a period of roughly from 1 to 10 years producing varying periods of relief but without any extended clinical arrest. The character of therapy in cross section was what one might expect for chronic dermatoses associated with pruritus, and ranged from hit-or-miss home or drug store applications to those of a strict regimen of skin hygiene, soothing applications, or stimulation with tars or their equivalent. Previous roentgenotherapy had been used in a minority of the cases. Epstein's<sup>7</sup> type of table is used in reporting the results because of its simplicity, i. e., by "good" we mean that the dermatosis and pruritus definitely improved and by "poor" that there was no appreciable change or that there was an actual increase in symptoms and a flaring up of the condition.

<sup>1</sup> U. S. N. Hospital, Philadelphia, Pa.

<sup>2</sup> MC FARRAR, R. M. H., BAKER, D. L., and LEVIN, H. R. Local therapy with pyribenzamine hydrochloride. *J. Invest. Dermatol.* 19: 41-42, Feb. 1945.

<sup>3</sup> FLUMM, B. Topical treatment with theophylline. *Postgrad. Med.* 4: 442-446, May 1944.

<sup>4</sup> LEVIN, H. R. Dermatitis due to alkyl alkyl agents. *J. Invest. Dermatol.* 12: 1-11, May 1949.

<sup>5</sup> LEVIN, H. R., and HIRSH, W. R. Reactions to local use of theophylline. *J. Invest. Dermatol.* 13: 23-24, July 1949.

<sup>6</sup> LEVIN, H. R., and HIRSH, W. R., and WATSON, G. A. A. Alkyl alkyl therapy in dermatology (Chart).

<sup>7</sup> EPSTEIN, R. and M. LEVIN, W. J. Histamine cream in treatment of pruritic dermatoses. *J. Invest. Dermatol.* 12: 145-146, May 1949.

TABLE 1

Dermatosis	Number of patient	Effect on dermatosis				Effect on pruritus			
		Good		Poor		Good		Poor	
		Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Atopic dermatitis	3	3	100	0	0	3	100	0	0
Neurodermatitis	12	8	67	4	33	8	67	4	33
Psoriasis	9	5	56	4	44	5	56	4	44
Pruritus ani	3	2	67	1	33	2	67	1	33
Lichen simplex chronicus	1	1	100	0	0	1	100	0	0
Acute pruritus	2	1	50	1	50	1	50	1	50
W. in ear skin	1	1	100	0	0	1	100	0	0
Eczema (scratches, contact, et cetera)	16	12	75	4	25	12	75	4	25
Recurrent herpes simplex	1	1	100	0	0	1	100	0	0
Bacterial ite	1	1	100	0	0	1	100	0	0
Impetigo of face	1	1	100	0	0	1	100	0	0
Pyrexia vulgaris	1	1	100	0	0	1	100	0	0
Diaper rash	1	1	100	0	0	1	100	0	0
Total	82	57	71	25	30	57	70	25	31

## RESULTS

As shown in table 1 71 percent of the patients showed good results with regard to improvement in their dermatosis and 70 percent good results in relief from their pruritus. This parallelism alone is interesting. Some of those showing no improvement in their dermatoses complained that the ointment was too drying. Two patients with psoriasis were in a state of generalized exfoliative dermatitis and poor results were expected because they were generally sensitive to even the mildest types of medication. One patient with eczema experienced no change in his condition; one cleared about 90 percent within 2 weeks and then relapsed, and 2 were definitely worse after using the ointment for only 24 hours.

Nine of the patients originally treated with the compound under investigation were later given a trial of therapy using the same ointment but without the antihistaminic. The patients with generalized exfoliative dermatitis following psoriasis could not tolerate either compound. One patient with nummular eczema and one with neurodermatitis showed initial improvement with the first compound then relapsed and experienced no relief when tried with the tar ointment only. One patient with neurodermatitis noted no change with the use of either ointment. Two patients with generalized psoriasis, one with atopic dermatitis, and one with senile skin all experienced marked improvement with the antihistamine-tar ointment and from moderate to no improvement with the ointment containing only tar. Three of these patients requested to be put back on the original ointment after 48 hours of using the tar ointment. Examination of patients who could not tolerate the ointment or who experienced poor

results revealed none in whom sensitivity could be considered to have developed. Sensitization or irritation caused by lanolin has been noted in one and by the tar component in another patient. Patch tests with a combination of tar and antihistaminic were negative.

According to Obermayer and Becker coal tar has antipruritic, antiacanthotic, vasoconstrictive, keratoplastic and antiparasitic effects, with the exact constituents or group of constituents of the tar responsible for the therapeutic effect not being completely determined. Lewis, Davis, and Waldriff considered the effects of antihistaminics when applied locally to be procaine-like in nature. From what we have observed in comparison with the fairly predictable response to be expected from preparations of coal tar alone, the tar and the antihistaminic combination is about 20 percent more effective than the tar alone. No curative value as such is apparent other than that which might be expected to follow from a more prompt relief of the pruritic element.

#### SUMMARY

Of 52 patients treated with an ointment combining a crude coal tar extract and an antihistaminic compound 71 percent experienced a good effect with regard to their dermatoses and 75 percent experienced good results in relief of pruritus. None developed sensitivity to this compound although such a reaction could be expected occasionally in a larger series. No incompatibilities were demonstrated when the combination was used in those conditions in which crude coal tar or its derivatives are considered to be of value. Crude coal tar extract and antihistaminic substances when used locally appear to have a synergistic action, and the combination appears to be more effective than the use of tar alone.

\* KILK, E. L.: Personal communication.

OBERMAYER, M. E., and BECKER, S. W.: Study of crude coal tar and allied substances preliminary report. Arch. Dermat. & Syph. 31: 796-810 June 1935.



# Antabuse Therapy in the Army

## A Preliminary Report of Fifty Cases<sup>1</sup>

CHARLES T. BROWN, Major MC U S A.

EDWARD C. KALONICK, Captain MC U S A.

THE soldier in all times has been assailed by enemies far more deadly than those who come merely to test his armor. Among the most deadly of these foes is alcohol. Alcoholism with its manifold implications exists as a barrier to the best effectiveness of any army, and presents a serious obstruction in the care of its veterans. It follows that effective treatment of alcoholism in the Armed Forces is of importance not only to these Forces, but also to the nation which they serve. The new drug antabuse,<sup>2</sup> has been reported enthusiastically in the treatment of alcoholism. Our culture demands that new therapeutic agents be put to use quickly and on a large scale, thus limiting the time for their complete evaluation. It is believed that even in the best hands antabuse presents intrinsic dangers, and that the wide dissemination of preliminary findings concerning its use is indicated. This article concerns initial work in the first 50 patients treated with antabuse at this hospital.

### ALCOHOL AND THE SOLDIER

*Historical and traditional considerations*—The Surgeon General of the Army in his discussion of sickness and mortality in the Army of the United States during the 10-year period 1820 to 1838 inclusive reported "The dreadful effects induced by inebriation have been shown in the details of each post \* \* \* Its agency, directly or indirectly in the causation of phthisis pulmonalis and epidemic cholera, has been abundantly pointed out and its intimate connection with febrile diseases, diarrhea and dysentery and hepatitis, although not definitely determined is so apparent that it is constantly dwelt upon in the reports of medical officers \* \* \* These are not, however the only deaths arising from drunkenness \* \* \*".

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Received for publication June 1934.

Fort James Army Hospital, Denver, Colo.

Antabuse supplied for research purposes through courtesy of Ayerst, McKenna and Harrison.

Author: F. M. A History of the Medical Department of the United States Army. Houghton Mifflin Co. Boston, Mass., 1929.



That alcohol did not escape the attention of those historians compiling the activities of the Medical Department during the Civil War is attested by the statement under a section of their work entitled "Alcoholism." "Under this term may be included the statistics of merriment, delirium tremens, and chronic alcoholism. They have also included a statistical graph showing such incidences among white and Negro troops. The Army of the Potomac, during the year ending 30 June 1862, three fourths of which was spent in the immediate vicinity of Washington, recorded an admission rate of 5.3 cases per 1,000. During its years of active service ending 30 June 1863, 1864 and 1865 the admission rates for alcoholism were 1.5, 1.8 and 0.8 respectively for 1,000 troops. It is significant that they refer to the conditions of alcoholism as a "sickness."

Following the last Indian War and the Battle of Wounded Knee in 1890 a medical officer wrote to General Southerland from Fort Riley: "The post surgeon is skeptical as to the sanitary value of the canteen. He has treated more cases of alcoholism and has sewed up more cut heads in a given time since its establishment than previous, and this does not argue in its favor."

The annual report for the fiscal year of 1890 which covered the earlier part of the Spanish American War revealed the admission rate for alcoholism to be 2.40 per 1,000 enlisted men.

Our historians, in their writings of the First World War presented more detailed statistics of the incidence of alcoholism among our troops the admissions covering the period from 1 April 1917 to 31 December 1918 being 1.18 per 1,000 men. This rate did not include those cases classed as alcoholic psychoses, the rate for which was 0.14 in the same period. They made this significant statement: "It must be understood that, as used here, the term alcoholism signifies more than intemperance, and the term 'alcoholic' more than a drinking man." Great emphasis was placed by these writers on another enemy of the fighting man, when they showed tables comparing the incidence of venereal disease with that of alcoholism. The national prohibition of alcohol exerted its influence on the soldier. It has influenced the Army life and may influence it still more in the future. It cannot be wholly ignored in any history of the times.

On November 21, 1918, Congress passed the War Prohibition Act which forbade until the completion of demobilization

The Medical and Surgical History of the War of the Rebellion. Part 2, Vol. I. United States Government Printing Office, Washington, D. C. 1908.

U. S. Army Medical Department United States History of the World War. The Medical Department of the United States Army in the World War, Vol. I, Neuro-psychiatry. The United States by Col. Pierre Ballez, Lt. Col. Frankwood E. Williams, Maj. Paul Kamm. The American Expeditionary Forces by Col. Thomas W. Holmes and Capt. Norman Paxton. United States Government Printing Office, Washington, D. C. 1923.

tion the sale for beverage purposes of all intoxicating drinks. This remained in effect until the eighteenth amendment to the Constitution became effective."<sup>4</sup> The admissions per 1,000 men had increased to 10.59 by 1927 which may be considered a reflection of the times. This was the post-bellum era of the "roaring twenties." From 1927 until the repeal of the Prohibition Act in 1933 the figures for admission gradually declined to 5.79 per 1,000 enlisted men.

This continued until a new low of 2.4 was recorded for 1941. The unhappy details for World War II are yet to be recorded in their entirety. Hurst<sup>5</sup> said "Men suffering from the early stages of various war neuroses precipitate their final breakdown by attempting to keep themselves going by means of alcohol." The rates of admission for the war years declined to 1.64 in 1945.

*The present problem*—There has been greater realization during and since the last war that the soldier is not only a physiologic fighting machine, but also a thinking feeling human being who fights best when his psychologic needs are known and implemented. Although there is a conceptual carryover among certain of both line and medical officers who act out aggressive feelings toward the alcoholic, the better informed are carrying out the wartime concept of utilization rather than condemnation. Many valuable and intelligent soldiers are not fully effective and may even eventually completely destroy their usefulness through overindulgence in alcohol. The elimination of the unfit is a relatively simple administrative procedure but the replacement of an intelligent experienced, otherwise valuable alcoholic officer or enlisted man is a different matter. In the past a compromise has been made in each case, weighing the man's assets and training against his absence from duty, real and potential poor judgment, undependability and effect on morale. Any increase in the salvage rate of these men through treatment with antabuse would help to solve this problem.

#### PHARMACOLOGY OF THE DRUG

In 1918, Hald and Jacobsen<sup>6</sup> reported experiments with tetraethylthiuram disulfide (antabuse) in which they found that persons who had ingested this substance and then consumed alcohol showed symptoms which differed quantitatively and qualitatively from the common findings of alcoholic intoxication. Martensen-Larsen, their co-worker, conducted a series of clinical experiments that demonstrated

HURST, A. B. and H. W. KOTT, P. A. and ROSE, T. A. *Medical Diseases of War*. Medicine. The Williams & Wilkins Co. Baltimore, Md., 1941.

HALL, J. and J. CORNELL, E. *Drugs and the War*. The War Department. 1918. 1941. 1944. Dec. 1944.

MARTENSEN-LARSEN, O. *Treatment of alcoholism with sensitizing drug*. *Lancet* 2 1946 Dec. 25, 1946.

the intense discomfort experienced by persons on antabuse following consumption of alcohol. They concluded that the drug might be useful in treating alcoholism in that not only was psychologic aversion induced but also physiologic intolerance. Such intolerance to alcohol remained manifest so long as the patient continued to ingest small doses of the drug. Little is known concerning the physiologic action of the drug. It is used in the rubber industry as an antioxidant and in the absence of further experiment which will prove or disprove this hypothesis for physiologic action, it is presumed that the drug acts as an antioxidant in the body with a more or less specific action on alcohol and its derivatives.

The drug is highly insoluble in water but will form the hydrochloride under optimum conditions. It is soluble in organic solvents such as acetone, alcohol, ether, and benzene in varying degrees but is not soluble in the fats carried by the blood. Absorption into the system is not known exactly but there appears to be a blood or tissue level. Rats tested with the drug at this station were given 20 mg. per kilogram of body weight for 4 days and then divided into two groups. One group was given alcohol by mouth and the other group an intraperitoneal injection of a sublethal dose of alcohol. In both groups a severe reaction was noted with acceleration of pulse and symptoms of intoxication preceding unconsciousness. None of the rats given antabuse died immediately as a result of this treatment, and all regained consciousness. A control group of antabuse-free rats given only alcohol had milder reactions to the alcohol without the extremely rapid pulse and none became unconscious. Jacobsen and Larsen reported similar findings with rabbits and attributed the increased respiratory rate and pulse to the toxic action of acetaldehyde which resulted from the incomplete oxidation of the alcohol. Two comprehensive reviews of the literature concerning both the drug and its clinical application have been published by Jacobsen and Martensen-Larsen<sup>1</sup> and by Glul.<sup>2</sup>

In man, antabuse alone is relatively nontoxic and no noteworthy effect is observed after single doses of 3 grams or after doses of 0.25 to 1 gram are taken daily for months, but when a person taking antabuse meets alcohol even in small quantities a train of unpleasant symptoms is inaugurated within a few minutes. How far the patient goes into the sequence of symptoms known as "the acetaldehyde syndrome" is largely a function of the alcohol intake but all patients experience regret even to have started. Usually within from 5 to 10 minutes, the patient complains of a disagreeable warmth or flushing

<sup>1</sup>JACOBSEN, E. and MARTENSEN-LARSEN, O. Treatment of alcoholism with tetraethylthiuram disulfide (antabuse). *J. A. M. A.*, 129: 914-922, Apr. 2, 1943.

<sup>2</sup>GLUL, E. Treatment of alcoholic chronic intoxication with antabuse with exceptions or its trial in United States. *Quart. J. Stud. on Alcohol*, 10: 165-197, Sept. 1949.

of the face, which later extends to the neck and upper part of the trunk. These areas gradually become intensely flushed. The skin temperature over these parts is increased. The sclera becomes characteristically injected and slight edema under the lower eyelids may be noted. During this period, although there is no marked change in the blood pressure, there is an increase in the pulse rate, which may rise to 140. At about 30 minutes both the systolic and diastolic pressures begin to fall. The most rapid and pronounced fall is that of the diastolic, which may drop to 40 or less. The intense flushing is soon replaced by marked pallor and mild cyanosis. The patient complains of dyspnea, sensations of constriction in the throat, tightness and discomfort in the chest, and nausea. This is the peak of the reaction. Profuse vomiting and often severe retching usually terminates the "conditioning situation," and the patient returns to a physiologically normal state within from 1 to 2 hours. Occasionally the nausea and vomiting may be delayed from 1 to 3 hours following the ingestion of alcohol, but the intense discomfort is uniformly experienced in all subjects.

#### METHOD OF STUDY

*Selection of patients*—The patients selected for this study were chosen from both active duty personnel and veterans who exhibited serious alcoholic problems. In all instances they were free from psychosis, well motivated and insofar as it was possible to ascertain, relatively free from marked psychopathy. It seemed wise not to entrust this drug to a class of patients who are distinguished for their lack of forethought and sense of responsibility. The self-referred patients appeared to be sincere in their desire to recover from their illness, and appeared to be cooperative and well motivated for the treatment which had been discussed with them in detail. Certain patients referred by their commanding officers showed considerable motivation.

The patients under discussion routinely experienced these stages of treatment: (1) open ward, (2) closed ward, (3) open ward, (4) out patient. On initial admission the patient was placed in the open section of the neuropsychiatric service for preliminary studies which included interview, physical and neurologic examination, psychologic and psychometric evaluation, and laboratory tests. If the patient was in an intoxicated state at the time of admission, he was admitted to the closed section for detoxification and "drying out" procedures. The generous use of modified mullin, with an abundance of nourishing food, routinely produced a dramatic improvement in the debilitated alcoholic within a relatively brief period. Thus preparation of the subject is most important in order that he be in optimum

physical condition prior to his treatment with antabuse bearing in mind that rather violent responses and reactions to the drug are not unknown. The patient must have been abstinent from alcohol for at least 7 days before the beginning of treatment. That this also applied to paraldehyde if such had been used for sedation, may be appreciated, because paraldehyde being a polymer of acetaldehyde gives a positive reaction to tests for acetaldehyde.

In any event, the 4-day period from the initial dose of antabuse to completion of the first drinking trial was spent on the closed ward. It was believed advisable to cause the patient to have his first drinking trial under ideal, rather than either fortuitous or clandestine conditions. Parenthetically we did encounter some whose pride was injured by our evident lack of faith in their ability to keep their word in regard to drinking. The patient was returned to the open ward after his first drinking trial, and after his second was discharged from the hospital with a 4-day supply of antabuse. Routinely patients reported at weekly intervals for their supply of the drug and active duty personnel were afforded group or individual psychotherapy in accordance with our plan of study.

*Laboratory procedures*—The laboratory clearance of patients scheduled for treatment with antabuse provided maximal protection to the patient and secured as much related information as possible. It was desired to learn as much as practicable of the physiologic response during the reaction. Furthermore it was necessary to determine the minimal, economical, safe standard routine for patient clearance for antabuse therapy with an eye to the future. Because of the potential violence of the reaction experienced by patients during drinking trials, several possible contraindications for treatment were considered. Any condition which results in general dysfunction or which has left the patient in a generally debilitated condition should be carefully considered before treatment with antabuse is begun. This treatment was considered to be contraindicated in patients with cardiovascular disease, epilepsy, advanced cirrhosis of the liver, diabetes mellitus, and thyroid dysfunction. Antabuse treatment in patients with these diseases was considered worthy of investigation, but it was thought wise to defer any investigation of these patients until we had accumulated experience with more healthy and robust patients.

Electrocardiogram, electroencephalogram, BMR, complete blood count, urinary brom sulfalein retention, glucose tolerance, urine concentration inhibition test, carbon dioxide combining power and blood alcohol level determination have been routine pretreatment laboratory tests. Brom sulfalein retention was adopted as a screening test for liver disease because only advanced cirrhosis is considered to affect the detoxifying power of the liver to the point at which this

type of treatment might have serious consequences. Laboratory methods employed were those given in TM 8-277 U S Army Methods for Laboratory Technicians," October 1940 with the exception of acetaldehyde determinations which were made by the Stotz<sup>1</sup> method.<sup>12</sup> Laboratory follow up of patients was scheduled after 6 months on the drug in an attempt to determine whether or not there were any long term organic changes from the drug which might make its use undesirable in prolonged treatment and to repeat work by Hald and Jacobsen. They reported that some patients were given 0.6 gram daily for several months without subjective or objective symptoms apart from those following the ingestion of alcohol.

*Psychiatric procedures*—Each patient was subjected to psychiatric interview and evaluation procedures, including psychologic testing. The details of this are not germane to this article since the psychiatric findings are the subject of a related study. No effort was made to delay antabuse treatment for this work up because speed of processing and return to an effective status was desired. Furthermore it was believed that psychiatric study in detail could well be undertaken when the patient gained out patient status.

*Technic of conditioning*—All patients were transferred to the closed ward for the initial administration of antabuse which was for a period of 4 days. The drug was given on the following schedule at bedtime. First day 2 grams second day 1.5 grams third day 1 gram fourth day 0.5 gram. Patients must be given antabuse for about 4 days prior to their first drinking trial in order to develop their primary intolerance. This so-called trial is the patient's initial contact with alcohol following the ingestion of the drug and is indeed an educational experience. It is at this time that the patients experience the disagreeable symptoms of the acetaldehyde syndrome.

Breakfast was withheld on the fifth day and the patients were moved to the "conditioning room." The blood pressure, pulse, respiration and temperature were recorded and the patient was then given 30 cc. of 100-proof whisky. Within 5 minutes, the subjective and objective symptoms that have been described were observed almost uniformly in each subject. At the peak of the reaction most extreme discomfort was reported and was followed generally by nausea and vomiting usually within an hour. As a rule it was not necessary to give any more than 30 cc. of whisky to produce this effect, but it was necessary to give a few patients from 15 to 30 cc. more in order to secure a reaction of sufficient severity to produce the desired aversion.

Stotz, I. Colorimetric determination of acetaldehyde in blood. J Biol. Chem. 148: 53-59, June 1942.

<sup>12</sup>The test is extremely sensitive and requires small quantities and must be very carefully performed.

Furthermore, the aversion was found to be intensified and the peak of reaction more quickly achieved by following the initial dose of whisky with from 5 to 10 cc. of various other beverages such as wine, gin, rum, brandy and warm beer. The administration of these additional beverages in small quantities is desirable inasmuch as the subject is thus afforded an opportunity to develop a distaste for intoxicants other than whisky. It was determined through experience, that the patient should not be given more than 60 cc. of whisky or its alcoholic equivalent in other beverages. Any amount in excess of this served no purpose other than to intensify the reaction to the point of shock which in some instances proved alarming. In such cases, it was found that the administration of oxygen usually promptly relieved these symptoms. Occasionally a patient was given saline infusions and supportive drugs. The most dramatic, as well as the most alarming feature of such patients was the rapid fall in both systolic and diastolic pressure along with a rapid thready pulse accompanied by cyanosis and other signs of vasomotor collapse. This may be obviated by the exercise of caution in the administration of the beverages. Such complications in a drinking trial must be attributed to the amount and rapidity of ingestion of alcohol in an unusually sensitive person.

Following recovery from the first drinking trial, the patients were transferred to the open ward and maintained on a dosage of 0.5 gram of antabuse daily. It was found that about 50 percent of the total number of patients studied in this series complained of fatigue and drowsiness if given the drug during the day. This was obviated by administering it at bedtime. On the eighth day the patients were returned to the conditioning room for their second and final drinking trial. This was identical with the first, except that only 20 cc. of whisky were given. Patients experienced the initial sensations of warmth and flushing but the reaction rarely progressed to the stage of nausea and vomiting. Little variation in blood pressure was noted, although the characteristic feeling of constriction of the throat and tightness in the chest was common. Some elevation of the pulse rate and an increase in respiration was also uniformly seen. Within an hour the patients had completely recovered from their second conditioning experience with alcohol. None of these patients desired even the diminished dose of whisky on the eighth day and some vehemently voiced their objections. The patients were then considered to be adequately conditioned and were discharged to an out patient status. Each patient was given a 1 week supply of antabuse with instructions to continue on a maintenance dose of 0.5 gram nightly. He was also instructed to return to the hospital at weekly intervals for a follow-up interview and a new supply of the drug.

## FINDINGS

*Laboratory*—Pretreatment laboratory screening of patients yielded essentially negative results even in patients with a long history of alcoholism. Glucose tolerance tests, blood counts, urinalyses and concentration-dilution tests were all within normal limits. None of the patients checked showed more than 4 percent retention of bromsulfalein in 45 minutes. This was interesting in view of the popular belief that excessive drinking ultimately results in extensive liver damage.

During the drinking trials, blood samples were taken at the peak of the reaction established at the time the vasomotor changes were at their height as evidenced in the transition from flushing to pallor to cyanosis, and the blood pressure was at its lowest point. This was commonly found to be immediately prior to the patient becoming nauseated and vomiting. The findings in these patients closely parallel the findings of Hald and Jacobsen,<sup>11</sup> and Larsen,<sup>12</sup> in that there was an abrupt increase in acetaldehyde, apparently dependent on the blood alcohol level and the intake of alcohol during the drinking trial. In the first drinking trial when the patient was given from 30 to 60 cc. of 100 proof whisky, the acetaldehyde level was about 50 percent greater than on the second drinking trial when he was given about half the initial dose of whisky. For the method of Stotz, an acetaldehyde level of less than 100 micrograms per 100 cc. is within the normal range. Fasting acetaldehyde levels of patients covered in this report ranged from 63 to 383 micrograms per 100 cc. (average 159) for patients processed. During the first drinking trials, acetaldehyde values ranged from 305 to 2,844 micrograms per 100 cc. (average 690). Second drinking trials yielded values ranging between 300 and 627 micrograms per 100 cc. (average 411). It was found that the increase in acetaldehyde level closely paralleled the increase in that of the blood alcohol.

Levels for blood alcohol ranged from 0.5 to 1 mg. per cc. at the peak of reaction. With few exceptions patients were given the same dose of alcohol therefore the rate of absorption and individual detoxifying power appear important in the elimination of acetaldehyde and prolonging the time required for a patient to reach the reaction peak. In all patients there was a drop in carbon dioxide combining power during reaction. The average drop ranged from 10 to 20 points below the pretreatment value.

*Clinical*—The therapeutic results, shown in figure 1, are on our first 50 patients, because they have been under treatment for over 6 months.

11. H. J. Hald and E. Jacobsen. Formation of acetaldehyde in the organism after ingestion of glucose and alcohol. *Acta Pharmacol. et Toxicol.* 4: 205-210, 1948.

12. A. T. Larsen. Effect on experimental alcohol of antabuse in combination with alcohol. *Acta Pharmacol. et Toxicol.* 4: 321-332, 1948.



With the passage of time there is attrition within the group of abstainers and to include the seemingly better results in our more recent patients would not be justified even in a preliminary report. The group indicated as "lost contact" is not to be construed as treatment failure. Contact was lost usually because the patient underwent social recovery to the extent that he secured a better paying job in another locale. Any patient who fell into the failure group and then disappeared is still counted as a failure. Many of our patients had repeatedly undergone various therapies for the alcoholism. We have found no reason to believe that failure on other therapies in itself predisposed to failure on antabuse. Our failures have been limited to those best described as pathologic personalities. Conversely we have found that successful antabuse treatment seems to be a direct function of motivation. In our "treatment success" group there has been considerable economic betterment.

SOME DRY (SOCIALLY RECOVERED)

MUCH IMPROVED (MOSTLY DRY)

FAILURES (NON-COOPERATIVE)

LOST CONTACT



0 20 30 40 50

Figure 1.—The results of antabuse treatment on the first 50 patients for a period of 8 months.

Side effects have been minimal, and it is not clear whether they are caused by drug idiosyncrasy or to psychologic factors. Complaints of fatigue, drowsiness, vague gastrointestinal uneasiness, and headache were usually transient and may be ignored in view of the ultimate goal and the rewards in treatment. Only one patient developed allergic phenomena which appeared as a mild generalized urticaria following the administration of antabuse. The reaction developed after the first day on the drug and it was intensified during the first drinking trial. A reduction of his dose and the administration of pyribenzazine in doses of 50 mg. completely relieved his symptoms which at no time necessitated the abandonment of antabuse therapy. The acetaldehyde syndrome sometimes assumed alarming proportions, often with a drop in blood pressure to the vanishing point. The mainstay of treatment for this complication was oxygen which was routinely administered as soon as it was believed the patient had been sufficiently improved by his experience. It is likely that the lower oxygen tension in this mild complication has to do both with the alarming reaction and with the effectiveness of our low maintenance dose.

The older patients showed much more tolerance to the drinking trial as well as much less initial apprehension than did the younger but there was no correlation between age and blood acetaldehyde level.

A state of classical conditioned reflex does occasionally occur and we do not overlook this possibility. Several of our patients have remained abstinent over periods of months without the drug. These periods have been occasioned by the patient's inability to return on schedule for his drug and our almost consistent refusal to provide more than a 7 days supply. One patient off the drug for over a month tested his alcoholic tolerance and claimed he experienced all the subjective manifestations of the acetaldehyde syndrome.

#### DISCUSSION

In principle, the aversion or conditioned reflex treatment of alcoholism is not new to medicine. Such treatment has met with varying degrees of success in the hands of its exponents, but often proves to be not only expensive, but also disappointing. Nonetheless, such therapy has been among the most effective known. Antabuse probably is not a cure for alcoholism. It is generally conceded that in alcoholism we are dealing basically with a psychiatric problem with altered physiology frequently complicated by pathologic changes of varying degrees. Antabuse is to be regarded merely as an adjunct in therapy by which the patient is given a psychologic as well as physiologic aversion to the poison threatening his existence. In time such a "crutch" must be thrown away. The most important phase in treatment is said to be in the successful application of the best instruments in the armamentarium of the psychotherapist that fit the individual patient. Ultimate recovery of the alcoholic depends on the resolution of his psychologic distortions to the end that he is at harmony with himself and has been enabled to make a reconciliation with the world in which he lives.

Certainly the dynamics of alcoholism are interesting and just as interesting has been the swing of popular and professional opinion to the point of view that alcoholism is a psychiatric disease rather than any one of a number of other things. The general personality reaction of the alcoholic to withdrawal of his alcohol under closed ward conditions even for prolonged periods has in the past been accompanied by no particularly untoward symptoms, or even by anxiety. This is quite different from the reaction shown by the neurotic when suddenly deprived of his compensatory symptom, e. g., by hypnosis. In conversations with others concerning the psychiatric implications of antabuse therapy much concern was expressed that undesirable psychiatric symptoms would almost inevitably occur were the patient rendered physiologically incapable of drinking. This concern, which

we did not share, seemed based on theory rather than on experience. It is believed that antabuse therapy provides opportunity for the study of economically and socially productive alcoholics in their home environment in a state of abstinence unequalled heretofore except intramurally and that this opportunity for study may be well repaid in increased understanding of alcoholism.

### CONCLUSIONS

The production of the acetaldehyde syndrome by ingestion of alcohol in the antabuse-prepared patient, as reported elsewhere is verified. At the mile-high altitude of Denver with its reduced oxygen tension the syndrome is produced in patients prepared with small doses of the drug on the ingestion of from 30 to 60 cc of 100 proof whiskey with a routine violence of reaction not heretofore reported. The administration of oxygen markedly ameliorates the acetaldehyde syndrome at any stage and may be lifesaving. The treatment regime is potentially dangerous in that the antabuse-prepared patient is subject to developing acetaldehyde in amounts sufficient to produce an acute severe vascular collapse whenever he drinks alcohol. The alcoholic patient has had his own unique alcoholic experience which usually has led him to believe that his alcoholic prowess is great and that he can take a few drinks without any acute untoward reaction. In the face of this life experience it is only intravital demonstration that will convince him that he cannot drink while on antabuse. We believe that the danger of fatality can be reduced to a minimum only by carrying out the antabuse build up period and first drinking experience under closed conditions. Earlier published reports that the acetaldehyde level in the blood parallels that of alcohol are verified. When antabuse is released for general use it should be strictly on a prescription basis.

It has been my further impression that (1) antabuse therapy provides a partial solution to the problems of alcoholism peculiar to the Army (2) the antabuse-prepared patient cannot drink, (3) although a certain degree of conditioning is inevitable and not unwelcome, the prime therapeutic effect is the realization by the patient that he is physiologically intolerant to alcohol, thus taking the problem of abstinence entirely out of the realms of temptation and will power so that the subject can free his resources from fighting his problem, and use them in constructive efforts towards rehabilitation (4) antabuse treatment offers an opportunity for an entirely new psychiatric study of the alcoholic (5) the minimum routine clearance in addition to careful history and physical examination, should consist of cardiac evaluation including EKG, urinalysis, and the bromsulfalein retention test.

# Penicillin in Pulpal Therapeutics

SAMUEL L. GILBERT, Lieutenant Junior grade D.C. U. S. N.

*the best root canal filling is a living healthy pulp*

PULP capping in adults has always been considered a hazardous procedure. In general only those pulps mechanically exposed and occurring in young people are considered as having a chance to survive the capping.

To make a rational approach to the problems of pulpal therapeutics one must consider the pulp in the light of physiologic and histologic findings. The pulp is specialized, highly vascular, connective tissue imprisoned in unyielding walls of dentine. The vascular and nervous elements find entrance and egress through the constricted apical foramen. The surface of the pulp is differentiated from the rest of the pulp by a single layer of modified connective tissue cells (odontoblasts) from which fibrils (Tomes fibers) extend through the dentinal tubules to the dentino-enamel junction. Newly formed predentin is adjacent to the odontoblasts.

The pulp forms and nourishes the dentin. It responds to thermal, chemical, or electrical stimuli.

A persistent belief among dentists is that once the pulp is exposed it is doomed and if exposed as a result of caries it is doomed beyond any doubt or question. This belief contradicts the histopathologic findings.

The dental pulp, like other organs in the body is focally involved by an infection before the infection proceeds to general involvement. A focal infection, however, may evoke a pulpal edema sufficient to strangle the thin walled venules so rigidly imprisoned in the root canal. Inequifactive necrosis or gangrene is the unhappy result.

Bacteriologic studies of caries-affected areas of teeth have variously demonstrated *Streptococcus pyogenes* and *Str. brevis*, *Staphylococcus aureus* and *Staph. albus*, gram positive diplococci, *Str. viridans* and gram positive and negative bacilli.

The histopathologic findings suggest that many pulps mechanically or cariously exposed are amenable to treatment which is (1) non

Controls were deemed unnecessary in the preliminary work because the most important conclusion would not be the efficacy of penicillin but that pulps exposed by caries can be successfully treated (fig. 1).

The slight variations in technic are also of little consequence other than to demonstrate that a pulp exposed by caries is less critical than is generally supposed.

In a private practice it is difficult to check every case or even 75 percent of the cappings placed in the last 2½ years; nevertheless, pulp tests have been made on recall cases and x-ray pictures made to check pulp response (table 1). The pulp response to testing was within normal range.

TABLE 1—*Result of 245 pulp cappings*

Months elapsed since pulp capping											Total
	3	12	5	21	26	27	30	33	36		
Cappings performed	29	79	19	20	14	19		12		276	
Failures									2		

Age groups						Total
	3-12	13-14	15-21	22-26	26-36	37-40
Cappings performed	10		34	7	43	39
Failures					2	

#### SUMMARY

A rational basis for routine capping of pulps infected as a result of caries is stated and the criteria for a pulp capping agent are proposed. The author's technic using penicillin as the antibiotic is presented as clinical evidence of the successful potentialities of pulp capping.



# ACTH in the Treatment of Erythroblastosis

## Report of Two Cases

JOHN W. SIMPSON *Colonel MC U S A*

JOSEPH H. AKENFORD, *Majr MC U S A*

FRANK L. SWIFT *Capt in MC U S A*

LEO J. GERBERT *Lieutenant Colonel MC U S A*

**R**EPLACEMENT transfusion is now generally recognized as the treatment of choice in erythroblastosis fetalis. Although we have had excellent results with this procedure it is not without its limitations and dangers. Technically replacement transfusion may not be available and if available it may fail even in experienced hands. Even if the replacement is 90 percent complete, the quality of the remaining antibody is unaltered and the antigen-antibody reaction is only quantitatively reduced. Furthermore the treatment itself imposes a severe stress on the newborn infant. Ideally a treatment directed toward protecting the infant against the "acquired" hemolytic phenomenon and maintaining the physiologic integrity of the hematopoietic system would be the one of choice. Selye, Sayers and Sayers, Hills et al., Thorn et al. and others have emphasized the importance of the pituitary-adrenal mechanism in the response to stress. We believed that ACTH might enable the infant better to withstand the severe stress of replacement transfusion which is a prolonged surgical procedure.

The effective use of ACTH in the treatment of acquired hemolytic anemia is a matter of record.<sup>1-4</sup> Gardner<sup>1</sup> reports that during such

Brook Army Hospital, Fort Sam Houston, Texas

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5. L. J. M. Personal communication.

6. J. W. S. W. Blood Club Third Annual Meeting ACTH in leukemia. *Blood* 3: 791 Aug 1950

7. J. W. S. W. Blood Club Third Annual Meeting ACTH in leukemia. *Blood* 3: 791 Aug 1950

failure. Cyanosis accompanying dyspnea was usually a terminal feature. Dysphagia was usually related to sore throat, although in some patients it accompanied involvement of the ninth and tenth cranial nerves. The differentiation of dysphagia accompanying sore throat from toxic involvement of the cranial nerves was difficult. Generalized convulsions were considered to be attributable to bradycardia associated with heart block resulting in cerebral anoxemia (Stokes-Adams syndrome). Neurologic manifestations predominated on admission in two patients who were hospitalized because of blurred vision, inability to swallow and paralysis of the extremities.

TABLE 5.—Symptoms reported by 100 patients dying with diphtheria

Fever		Percent	
General symptoms	percent having	Gastrointestinal	percent having
Fever	88	Vomiting	31
Hyposthenia	6	Nausea	22
Hypersthenia	5	Abdominal pain	20
Weakness	5	Neurologic	percent having
Anorexia	5	Paralysis of extremities	21
Cardiorespiratory	percent having	Blurred vision	— 17
Sore throat	90	Convulsions	— 16
Dyspnea	71	Sensory changes	11
Cyanosis	64	Paralysis (intercostal, dia-	
Cough	16	phragmatic abdominal)	9
Hoarseness	15	Dis-orientation	6
Chest pain	13	Coma	6
Nasopharyngitis		Facial weakness	5
Hemoptysis	7	Nuchal rigidity	1
Precordial pain	5	Blindness	— 1
Palpitation	2		

#### PHYSICAL EXAMINATION

The physical findings are shown in table 6. The lowest pulse rate counted was 20 per minute in a patient with electrocardiographic evidence of heart block and idioventricular rhythm. Detailed information regarding the physical findings in reference to the heart and lungs was not recorded in many of the clinical records. This was because of the type of medical installation, the tactical situation, and the brief records required by certain mobile installations in overseas theaters. There was nothing pathognomonic about the diphtheritic exudate or membrane as evidenced by the variety of colors, odors, and types and consistencies described. The onset of paralysis or paresis of the cranial nerves or extremities occurred in from 5 to 40 days from the onset of the symptoms of the disease the average interval being 20 days.

TABLE 6—Physical findings in 100 patients dying with diphtheria

TEMPERATURE	Number of patients	EXTREMITIES	Number of patients
Under 100° F	6	Purpura	3
100°-101.9° F	40	Edema	8
102°-103.9° F	39		
Over 104° F	9	CARDIOVASCULAR	
Not recorded	6	Rhythm	
		Irregular	25
Total	100	Extrasystoles	18
		Gallop	11
		Bigeminal	8
		Fibrillation	4
PULSE		Pulsus alternans	4
Under 100	12	Dropped beats	2
100-110	40	Trigeminal	1
120-140	16		
Over 150	9	Tones	
Not recorded	14	Weak	37
		Friction rub	1
Total	100	Murmurs	
		Precordial systolic	14
SYSTOLIC BLOOD PRESSURE			
		DIPHTHERITIC MEMBRANE	
Over 100	17	Odor	
80-100	26	Foul	5
Under 80	30	Fetid	8
Not recorded	27	Nasty	1
		Acrid	1
Total	100	Strong	1
		Color	
HEAD AND NECK		White	31
		Dirty gray	26
Exudate on tonsils	85	Gray	21
Enlarged cervical glands	58	Yellow	15
Edema of pharynx	27	Black	4
"Bull neck"	15	Green	1
Ulcerations on pharynx	11	Type and consistency	
Pulsating neck vein	4	Adherent	12
Serosanguineous nasal discharge	2	Coughed up	12
Nasal membrane	2	Removable leaving bleeding surface	4
		Hemorrhagic	3
CHEST		Exudative	3
Pneumonitis	47	Necrotic	3
Atelectasis	4	Follicular	1
		Gangrenous	1
ABDOMEN		Slippery	1
		Pseudomembranous	1
Hepatomegaly	11	Purulent	1
Splenomegaly	3	Filmy	1
Ascites	1	Thick	1



tures above 102° F and an admission impression of acute tonsillitis was made in 57 cases. The textbook statement that a temperature above 102° F is seldom encountered in diphtheria, was not substantiated in this series. The correct admission diagnosis of diphtheria was made in only 18 cases, and in 10 cases it was made only after autopsy. This would demonstrate how unaware medical officers are of clinical diphtheria. This lack of clinical appreciation of diphtheria has been noted by other observers, and should stimulate physicians to be alert that any throat lesion presenting an exudate may be toxic diphtheria.

The omission of an inquiry under past history regarding diphtheria and the failure to perform a Schick test would appear to be inexcusable on the part of the examining medical officer. A negative Schick test connotes sufficient circulating antitoxin (from 1/40 to 1/60 units per cc. of blood) to protect a person against the majority of diphtheria infections with the exception of the *gravis* strain of the organism. If Schick tests had been performed, valuable statistical information would have been derived from the fatal cases, as it has been shown that in diphtheria epidemics the mortality among the immunized population was 0.2 percent compared with 20 percent among the nonimmune.<sup>24</sup>

Although throat cultures for *C. diphtheriae* were diagnostic aids, bacterial confirmation often required from 18 to 36 hours and was not helpful in making an immediate diagnosis. Concomitant throat smears for *C. diphtheriae* were positive in 42 patients and could be considered a definite aid in the diagnosis. Albuminuria has been considered a constant finding in diphtheria and its presence in 63 percent of the patients in this series should arouse an early suspicion of the disease. The presence of continued albuminuria is believed to connote a poor prognosis in diphtheria.<sup>25</sup> Leukocyte counts in this series were not helpful in establishing an early diagnosis. It has been reported that a leukocyte count over 10,000 in diphtheria indicates a poor prognosis provided the type of infection, whether mixed or pure, is taken into consideration.<sup>25</sup> Electrocardiographic abnormalities appear early in acute diphtheritic myocarditis and have been well covered in the standard texts.<sup>26</sup> Heart block (auriculoventricular and intraventricular) are reported to connote an ominous prognosis.<sup>26</sup>

Basso, A. De l'histoire de la vœdine les p. l'ne exte sur la mortalité p. diph. *Presse méd.* 33: 437-434, June 25, 1947.

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## SUMMARY

An increase in the prevalence of diphtheria among military personnel was coincidental with the introduction of large numbers of troops into the European theater where the endemic rate was high. An inquiry by medical officers regarding the past history relative to diphtheria was neglected in the clinical records. Many physicians failed to use the Schick test as a diagnostic and prognostic aid. Eighty-eight percent of the patients were hospitalized within 1 week of the onset of their symptoms. Fourteen patients contracted fatal diphtheria while in the hospital for other causes. One half of the patients had temperature elevations above 102° F and a high fever did not differentiate diphtheria from acute tonsillitis or other diseases. Of the cranial nerves the ninth and tenth were most frequently involved. The presence of a membrane on the pharynx was observed in 85 percent of the patients but no physical characteristic of this finding was pathognomonic of diphtheria. The initial throat culture was positive for *C. diphtheriae* in 60 percent and concomitant throat smears in 50 percent of the patients. Albuminuria occurred in 63 percent of the patients. Abnormal electrocardiograms were noted in 90 percent of the patients from whom records were obtained. The list of 24 diseases recorded as impressions in the clinical records prior to a final diagnosis of diphtheria reflected a lack of knowledge on the part of the medical officers of the clinical aspects of the disease. A correct diagnosis was made on admission in only 18 percent and it was made only after autopsy in 10 percent. The average delay of 6.5 days between the onset of symptoms and the administration of diphtheria antitoxin reflected the inaccuracy of the early diagnoses. Penicillin does not prevent or cure diphtheria.



## PATHOLOGY

The organisms tend to proliferate at the local site and under advantageous conditions produce a toxin which is extremely potent. The toxin affects the local tissues early, causing death and disintegration of the cells in the immediate vicinity of the organisms. As necrosis proceeds, ulceration occurs. Cellular debris, fibrin, leukocytes, and other blood and tissue elements form the typical membrane of this infection. Early there may be an inflammatory reaction about the lesion with erythema, edema, and tenderness. The toxin is absorbed by way of capillaries and perineural lymphatics. Peripherat nerve tissue, heart muscle and kidney tubules are affected early. Both sensory and motor nerve fibers are affected, but the latter are much more frequently involved than the former. The organisms are generally found under or at the edges of the membrane.

## CLINICAL FINDINGS

It is generally believed that *C. diphtheriae* is not able to penetrate the intact skin. Once the epithelial integrity is destroyed, either by trauma or cutaneous disease, organisms may be introduced and find a suitable medium for growth and toxin production. Diphtheritic lesions often occur on the lower extremities where various factors operate to produce breaks in the skin, but they have been reported from all sites, including the anal mucocutaneous junction. Insect bites and minor abrasions are common antecedents for lesions on the forearms and other areas. Diphtheria may impose itself on a variety of skin diseases including epidermophytosis of the body and/or toes, impetigo, eczema, acne, paronychia, and eczematous lesions, and when associated with the last the lesions tend to be extremely indolent.

Systemic reaction is almost always absent. The patient complains only of such discomfort as may be caused by the skin lesion. Symptoms such as fever and prostration, or other evidence of toxicity as seen in nasopharyngeal diphtheria, if present, are usually caused by secondary infection of the skin with other bacteria, such as hemolytic staphylococci.

The typical lesion is an ulcer which is rounded, relatively deep, and appears "punched out." Early it is covered with a gray yellow or gray brown membrane which can be peeled off leaving a clean, hemorrhagic base. The base dries quickly and forms a thin, leathery covering which becomes dark brown or black and rather adherent. This sloughs off spontaneously after a variable period of time usually in from 1 to 3 weeks after the onset of the infection. On manipulation, the adherent leathery plug can usually be loosened around the borders and it is from this site that smears should be taken. The

margin of the fully developed ulcer is usually sharply defined rolled appears slightly undermined and often has a purple tinge. The ulcers vary in size from a few millimeters to several centimeters. They may be multiple or single. They are commonly indolent and tend to break down frequently either spontaneously or on minimal trauma. After a few weeks they tend to become anesthetic to pin prick, a helpful diagnostic sign.

Healing follows a definite pattern. The previously rolled margins gradually flatten out. Epithelialization proceeds from the periphery toward the center rapidly at first but later more slowly. As a rule the exact center the most avascular area is the last to heal. Because of the large zone of avascularity larger scars are usually slow to heal.

### COMPLICATIONS

*Myocarditis* occurs in about 5 percent of patients with cutaneous diphtheria. It generally appears suddenly and early in the course of the disease. Acute parenchymatous degeneration is followed by reparative inflammatory reaction. Acute toxic myocarditis with heart failure is most common during the second week of the disease. It is associated with typical electrocardiographic changes.

*Peripheral neuritis* occurs in about 20 percent of these patients. It tends to develop insidiously without pain and may not appear for from 2 to 4 months. The development of the neuritis bears no constant relation to the severity of the diphtheria. The paralysis involves (1) the palate (with hoarseness and dysphagia), (2) the ocular muscles, and (3) one or more of the extremities the lower being involved more than the upper in that order of frequency. The period of most pronounced involvement lasts from 1 to 2 weeks, with slow recovery over several weeks. Recovery is usually complete.

*Gillain Barré-like syndrome* which is characterized by bilaterally symmetrical paralysis of the lower extremities, involving motor or sensory and motor changes, is associated with little or no increase in cells and a moderate increase in total protein (albuminocytologic dissociation) in the spinal fluid.

*Kidney involvement* that is characterized by albuminuria, cloudy swelling with necrosis of tubular epithelium, and interstitial damage. Glomerulonephritis is rare.

### DIAGNOSIS

The diagnosis will never be made unless the medical officer maintains a high index of suspicion. The following procedure is recommended: (1) Lift up the edge of the membrane and take the specimen for smear and culture from near the margin of the ulcer. (2) Inocu

late the culture medium with adequate material. (3) Make direct smears—generally of little value because the slide is almost invariably contaminated by numerous bacteria. (4) Use separate swabs on blood agar and on a Loeffler's slant with subsequent identification on tellurite medium, and by appropriate carbohydrate reactions. (5) If suspected the material should then be sent to the proper medical laboratory on a Loeffler's slant for appropriate animal inoculations for virulence studies. (6) Repeat cultures every 24 to 48 hours. Definitive diagnosis depends on skilled, experienced laboratory personnel.

#### TREATMENT

*Isolation*—Virulent diphtheria organisms may infect wounds, and patients with this disease should be removed promptly from a surgical ward.

*Diphtheria antitoxin* is indicated without waiting for laboratory confirmation if cutaneous diphtheria is suspected. It hastens the healing of the skin lesions if given during the first 2 weeks after the onset of the disease. After this it is used only to reduce the incidence of complications. An adequate dose should be given at the first injection. Injected antitoxin neutralizes that toxin which is free in the circulatory system. It has no effect on that which is already bound by the body cells. For an average case, give from 10,000 to 90,000 units intramuscularly. For the severe, toxic case, give 90,000 units intravenously and from 20,000 to 40,000 units intramuscularly. Preliminary skin testing should be performed in all cases. Use 0.05 cc. of 1:20 dilution of antitoxin intracutaneously and observe for from 20 to 30 minutes.

*Penicillin*.—Give an adequate dose intramuscularly and additional penicillin in local compresses.

*General*.—Absolute bed rest for at least 2 weeks. Observe for cardiac and neuritic complications. Appropriate general care. Attendant should be Schick negative. These lesions are best treated early while the ulcer is still small, in order to prevent large avascular scars.

#### CONCLUSIONS

Cutaneous diphtheria is a not uncommon tropical and subtropical disease of military importance. It should be suspected in any patient with a chronic indolent ulcer occurring in an endemic area.



# Abscess of the Spleen<sup>1</sup>

DOY L. ANDRUS, *Lieutenant MC U S A*

ROBERT C. RAY *Commander MC U S A*

FREDERICK W. COTTRELL, JR., *Lieutenant Commander MC U S A*

HENRY R. DELANEY JR., *Lieutenant Junior grade MC U S A*

**A**BSCCESS of the spleen although perhaps uncommon as a surgical entity is by no means rare from a pathologic viewpoint. Of 3 600 autopsies reported by Billings at the Pennsylvania Hospital, splenic abscess occurred in 0.7 percent. Walker reported a 0.4 percent incidence in autopsies performed at the Boston City Hospital. In spite of this not infrequent occurrence, there is little in medical literature concerning this condition. Because the correct therapeutic approach markedly reduces an extremely high mortality rate, it behooves us to keep such a diagnosis in mind. It is the purpose of this article to review briefly this disease entity and present a case of splenic abscess.

The pathogenesis of abscess of the spleen is of three types: (1) trauma, (2) extension from a contiguous pathologic process and (3) metastatic spread of infection. Elting states that almost all pyogenic bacteria except gonococci have been isolated in splenic abscesses. Undoubtedly the most common single causes are the organisms causing typhoid fever and acute vegetative endocarditis.

Approximately 17 percent of splenic abscesses are the result of trauma. Trauma produces a perisplenic hematoma which serves as a culture medium in the event of simultaneous bacteremia. Traumatic abscesses have been produced experimentally. Inlow<sup>2</sup> reviewed 23 cases of traumatic splenic abscess and added one of his own. He reported that conservative treatment in such cases resulted in a mortality of 100 percent whereas with surgical intervention the mortality dropped to 35 percent.

U. S. A. 1 Hospital, Coco Sol. C. Z.

BLU. A. E. Abscess of spleen. *Ann. Surg.* 89: 416-429, Sept. 1909.

WALKER. J. J. Abscess of spleen. *New England J. Med.* 203: 1023-1024, Nov. 10, 1930.

ELTING. A. W. Abscess of spleen. *Ann. Surg.* 62: 18, 1915.

INLOW. W. D. Traumatic abscess of spleen. *Ann. Surg.* 83: 303-319, Mar. 1927.

By contiguity the spleen may form the floor of an abscess cavity which results from extension of left subphrenic collections or infected gastric or colonic neoplasms.

Most splenic abscesses result from hematogenous spread of infection elsewhere. This may be an afferent spread by way of the splenic artery secondary to mastoiditis (Walker's case) furunculosis (Billings case<sup>21</sup>) otitis media (Cutler's case) peritonsillar abscess (Eliason's case) and thrombophlebitis (Lemmon and Paschal's case). Efferently intra abdominal suppuration reaches the spleen by way of the splenic vein following pyelophlebitis. Such suppuration may follow appendicitis (Wolfson's case) perforation of colonic diverticulum (Cooke's case<sup>22</sup>) salpingitis, et cetera. Splenic abscesses usually occur in multiple.

The clinical manifestations of abscess of the spleen are pain in the left hypochondrium, sudden or gradual in onset following a suitable history of septicemia or trauma. There may be little or no pain if the abscess is buried deep in the organ (Fauntleroy's case<sup>23</sup>). Abscesses of the upper pole of the spleen give rise to pleuritic pain whereas lower pole involvement produces peritoneal irritation. Left shoulder pain may be prominent. General symptoms and signs are those of spiking fever, chills, and leukocytosis. Splenic abscess should be considered in any patient with pain in the upper quadrant and signs of sepsis.

Physical examination reveals an enlarged, palpable spleen which is tender. Considerable left upper quadrant muscle spasm may be present as well as left costovertebral tenderness. Marked emaciation may be present. Radiologic examination may be of help in revealing an elevated left diaphragm with or without left pleural effusion, with the stomach and colon displaced medially on barium studies and even the left renal pelvis and calyceal pattern flattened on intravenous urography caused by extrinsic pressure. As a diagnostic procedure splenic puncture has been supported and condemned.

Without treatment patients with splenic abscesses run a severe septic course; the vast majority of these patients progress to a fatal termination if surgical therapy is not instituted. The procedure employed is either splenotomy or splenectomy the former being most

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 ELIASON, E. L. Splenic abscess. Ann. Surg. 97: 301-302, Feb. 1933.  
 LE, W. T. and PASCHAL, O. W. Jr. Splenic abscess with drainage and recovery. Am. J. Surg. 64: 641-642, June 1942.  
 WOLFSON, I. M. Abscess of spleen. New England J. Med. 263: 135-137, Feb. 2, 1941.  
<sup>22</sup>COOKE, W. T. Splenic abscess with splenectomy, pyelophlebitis complicating Well disease. Lancet. N. S. 9: 977.  
 FAULSTICH, A. M. Splenic abscess. J. A. M. A. 54: 290, 1911.

often practiced. The approach may be transperitoneal transpleural, or retroperitoneal.

In cases in which suppuration is localized to the spleen surgical intervention usually effects a cure. Of the 80 cases of splenic abscess Walker reported from autopsy material there were 22 in which abscesses involved other organs leaving only 8 cases in which surgery could have been beneficial. Clinically cases of splenic abscess should have a higher incidence of operability and cure particularly in this era of chemotherapeutic and antibiotic agents.

# CASE REPORT

M. T., a 17 year-old Spanish boy had always been in good health until 21 November 1949 when he was admitted to the hospital with the clinical picture of a ruptured appendix with diffuse, spreading peritonitis. Laparotomy confirmed this diagnosis. Appendectomy was performed drains placed, and the abdomen closed after placing 200 000 units of penicillin in the peritoneal cavity. Smear and culture of the peritoneal exudate was positive for *Streptococcus faecalis*. Postoperatively the patient received penicillin, streptomycin, Wamgensteen suction and intravenous fluids including whole blood. The course was uneventful for 5 days, then icterus was noted in the sclera. Liver function studies pointed to a hepatocellular type of jaundice, probably on a toxic basis from his peritonitis. Ten days following surgery his icterus cleared, his wound had healed except for minimal drainage from the drainage site, and the streptomycin was discontinued.

On the next day the patient had his first chill with his temperature rising to 106° F. He had daily chills and fever for the next 10 days but was otherwise asymptomatic. Physical examination was repeatedly negative as were blood smears and cultures and scout films of the abdomen and chest. The diagnoses of malaria, pyelophlebitis, liver abscess, or subdiaphragmatic abscess were considered but could not be substantiated clinically. The patient was started on aureomycin. On 6 December 1949 the patient complained of pain to the left of and below the umbilicus. Tenderness to palpation was elicited in the same area with the sensation of a mass present deep in the left gutter. A barium enema revealed a probable mass, extrinsic to the sigmoid producing a nonfilling defect on its medial contour.

An exploratory laparotomy was performed on 13 December 1949. Careful exploration revealed only a resolving peritonitis with no evidence of subphrenic, subhepatic, or perisplenic abscesses or abscess formation in the pelvis or in either lateral gutter. Postoperatively the patient received penicillin, streptomycin, and sulfadiazine. The



aureomycin was discontinued. The course was uneventful. All medications were stopped 10 days after surgery and the patient was discharged to home on 5 January 1940 with all wounds healed.

The patient returned on 17 January 1940 stating that he had had chills and fever every other day for the previous 10 days with associated headache, backache and anorexia. The temperature was 104° F. The patient was markedly dehydrated. The abdominal wounds were well healed. The liver and spleen were not palpable and no abdominal tenderness was elicited. Rectal examination was negative. Blood examination showed a red cell count of 4,700,000 and white cell count of 12,000 with polymorphonuclear segmented cells 3 percent and lymphocytes 15 percent. Malarial smear, blood culture, and urinalysis were negative. Roentgenograms of the chest were normal with no elevation of the diaphragm. Scout film of the abdomen revealed a questionable splenic enlargement. The patient had chills and fever every other day or so and noted slight pain in the left upper quadrant of the abdomen which was made worse on deep inspiration. Repeat roentgenogram of the chest revealed a healthy chest but an area of increased density suggestive of an inflammatory process in the left upper quadrant.

On 31 January 1940 through an anterior extraperitoneal approach, the left upper quadrant was entered and the perisplenic area drained of 100 cc. of pus positive for *Str. faecalis*. This seemed to be a solitary abscess cavity leading into the splenic parenchyma. Drains were placed and the wound closed. Postoperatively penicillin and streptomycin were restarted. His course was uneventful and he remained afebrile for 2 weeks. Roentgenograms reported on by Dr. F. W. Cottrell revealed an elevated left diaphragm with multiple air fluid levels in the left subdiaphragmatic space. The wound drained well and he remained asymptomatic. Three weeks following surgery antibiotics were discontinued. The next day he again had a chill and considerable tenderness was noted in the left flank posteriorly.

On 23 February 1940 the twelfth rib was resected with the idea of draining a perisplenic or splenic abscess pointing between the spleen and kidney. No abscess was found. The patient was turned over and the spleen approached transperitoneally. A perisplenic abscess was again encountered with considerable necrotic material present. Drains were placed and the wound closed. Penicillin was restarted and the post-operative course was uneventful.

By 1 March 1940 all medications were discontinued. On 23 March 1940 the patient developed a fever of 100° F. without any chill but with slight pain in the left upper quadrant. The fever persisted. Physical examination was negative. Roentgenograms of the chest re-

vealed an elevated left diaphragm with no air fluid levels subphrenically but a large mass filling the left upper quadrant. An intravenous urogram showed a filling defect in the collecting system caused by an extrinsic pressure.

On 6 April 1950 through a left subcostal incision the perisplenic space was exposed. The sinus tract which had been draining minimally led to the inferior pole of the spleen and then behind the spleen. No perisplenic abscess was present. The spleen was four times its normal size and fixed to the subdiaphragmatic peritoneum by dense adhesions. A splenectomy seemed the only choice and was performed. Drains were placed and the wound closed. The patient has made an uneventful convalescence the left diaphragm has reassumed its normal position as has the stomach and colon. He has been discharged from the hospital, well.

During the course of his two hospitalizations this patient received 85 000 000 units of penicillin 270 grams of sulfadiazine 124 grams of streptomycin and 24 grams of aureomycin. He was supported by 14 whole blood transfusions of 500 cc. each.

The gross specimen in this case as reported on by Dr. H. R. Delaney Jr., revealed a spleen approximately five times its normal size weighing 773 grams, and measuring 18 by 13 by 8 cm. One large splenic abscess measuring 2 by 3 by 7 cm. had eroded through the capsule of the spleen on its posterolateral surface. Cut sections revealed another abscess cavity measuring 2 by 2 by 2.5 cm. deep in the splenic parenchyma, as well as multiple smaller abscesses throughout the splenic parenchyma. Smears and cultures taken from these abscesses were all sterile. Microscopic sections revealed all abscess cavities to be lined by chronic granulation tissue. The pathologic diagnosis was (1) abscess of spleen multiple (2) perisplenitis, chronic and (3) splenic hyperplasia.

#### SUMMARY

A case of splenic abscess secondary to appendicitis with rupture peritonitis, and pylophlebitis has been presented. In spite of massive antibiotic therapy and splenotomy on two occasions, splenectomy was the only effective means of obtaining a good result in this case.





# Two-Stage Operation in the Cure of Massive Scrotal Hernia

CHARLES BUNCH *Commander MC U S A*

INGUINAL hernias, either unilateral or bilateral that have descended into the scrotum and become massive in size have been classified as inoperable in many cases. These hernias may be reducible but more often are irreducible.

Trusses in these massive hernias are of little or no value. In some cases they keep the hernia only partly reduced. Often they are of distinct harm—traumatizing the hernia without keeping it reduced. Many of these patients are more miserable with trusses than without them.

These patients, usually elderly males, are often fat and have hypertension arterio-sclerosis, diabetes, or bronchitis and some are nephritic or senile, but all are miserable with their hernia. Conservative treatment affords them no relief. One patient stated that he would rather die than live as he was.

Operative treatment presents obvious hazards. The age, condition of the cardiovascular and urinary systems, and general health of the patient must be considered and because these patients often do poorly after the usual hernioplasty the author contemplated performing a two-stage operation the object being (1) to replace a part or most of the abdominal contents within the abdomen so as not to embarrass respiration or cardiac function or produce too much shock, and (2) to wait until a later date to operate for the actual cure of the inguinal hernia.

The literature in three large medical libraries has been reviewed and no record of any two- or more-stage operations for the cure of such hernias was found.

A two-stage operation was planned and performed on a patient with a massive unilateral scrotal (indirect inguinal) hernia. Patients in his condition are often classified as inoperable. This patient made an uneventful convalescence and his hernia was apparently cured.

## CASE REPORT

E. L., a white veteran, 61 years old, was admitted to the U. S. Naval Hospital, Charleston, S. C., on 21 December 1919. He complained of a rupture that he had had for 28 years and for which he had worn a truss except during the last 6 months. In the past 3 months the hernia had become larger. On occasion he experienced severe pain in it. The hernia would become somewhat smaller when he would lie down but recently it would not totally disappear. On two occasions it would not go back at all and he had to have medical attention to obtain relief. He was fairly well developed and well nourished; his blood pressure was 150 systolic and 100 diastolic on one occasion, and 180 systolic and 120 diastolic on another; his pulse rate was 88. In the left side of the scrotum there was a large mass about the size of a football (14 inches in circumference) that could be only partially reduced by recumbency or applying gentle pressure. The external ring was about 3 fingers in width; the distance from the pubic tubercle to the bottom of the scrotum was 8 inches. The penis was lost within the scrotal folds. His arteries were moderately hardened. The electrocardiogram indicated that he had previously had an anterior infarction. Physical examination and laboratory studies were otherwise not significantly abnormal. Impression (1) left inguinal (scrotal) hernia massive (2) arteriosclerosis with cardiovascular disease and (3) senility.

Operation was performed on 30 December 1919 using spinal anesthesia with 10 mg. of tetracaine hydrochloride. An incision was made along the course of the scrotal portion of the sac. The sac was opened and found to contain a large mass of sigmoid (so-called sliding hernia). The sac of the sliding hernia was treated in the usual manner. A portion was sutured behind the bowel, the rest of the scrotal portion of the sac was trimmed away and the upper portion was closed with a running suture of No. 1 chromic catgut. The inguinal canal was not entered. A large portion of the right scrotum was resected and closed with cotton sutures. One Penrose drain was used.

The operation lasted 40 minutes and the patient was returned to his bed in good condition. He did well following operation and was soon able to move about, sit up and, except for some scrotal drainage, his convalescence was uneventful. On the 20th of January 1920, healing was complete and he was ready for the next operation.

On 30 January 1920 under spinal anesthesia, using 15 mg. of tetracaine hydrochloride, an incision was made over the inguinal canal. The cord was found to be considerably indurated. The sigmoid was found in the sac. The sac was excised further and the neck of the sac closed with chromic catgut. Repair was made with heavy cotton

sutures using the modified Halsted operation. The operation lasted 1 hour. The patient withstood this operation nicely and was returned to bed in good condition. He did well following operation sitting up the following day, eating, and taking fluids well.

On 6 February the sutures were removed. The wound was well healed and he was asymptomatic. He was discharged to home on 7 February 1950.

#### SUMMARY

A two-stage operation for the cure of patients with large scrotal hernias, and applicable for long standing hernias in elderly patients is described. Such a procedure can be used in patients who are poor operative risks. Operation in two stages shortens operating time, lessens trauma shock, and, it is believed, will lead to a cure in cases that are often classified as inoperable. The procedure involves (1) excision of the scrotal portion of the sac (or most of it) in the first stage, partially reducing the hernia and (2) operation later for the actual cure of the hernia by hernioplasty (the inguinal canal is not opened until the second stage). No record has been found in the literature of any multiple stage procedure being employed previously.





# Cholelithic Intestinal Obstruction

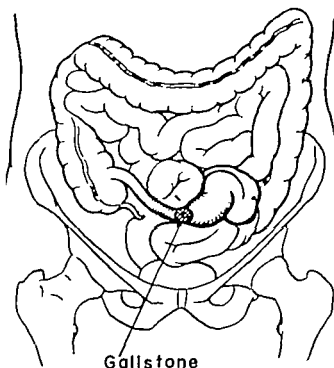
DANIEL H. MANFREDI, *Lieutenant Commander MC U S N R*

**A**CUTE intestinal obstruction caused by gallstones is a rare condition which allegedly carries with it a high mortality rate. About 2 percent of all cases of acute intestinal obstruction are caused by the presence of gallstones in the intestinal tract. A gallstone large enough to cause obstruction i. e., greater than 2 cm. in diameter, must of necessity pass through a cholecystenteric fistula.

Case reports have appeared in the medical literature in which a fistula has been found between the gallbladder and the stomach, duodenum, ileum jejunum, or large bowel. The gallstone usually erodes its way through the gallbladder wall during which adhesions form between the viscera and gallbladder. Finally erosion of the wall of the involved viscera occurs with perforation into its lumen. Women are most frequently affected by this condition because cholelithiasis is more common in them than in men. The preoperative diagnosis is frequently missed, although it may be suspected and roentgenographic studies may give a clue. Women in the latter decades of life with a history of gallbladder disease and with symptoms of intestinal obstruction should be suspected of having this condition, provided other causes of intestinal obstruction such as hernia and cancer have been ruled out. The usual course of this condition as illustrated in the reported case, is one of intermittent obstruction, followed later by a sudden acute complete obstruction.

The size of the stone is important for as mentioned previously, a small stone (less than 2 cm.) may pass completely through the intestinal tract unless stopped by some extrinsic factor such as a fibroid tumor or cyst or adhesion as illustrated in our case. The larger stones usually are caught in the region of the ileocecal junction (fig. 1). The diagnosis of intestinal obstruction is readily made and there are three points of importance in the roentgenologic studies which are (1) the evidence of intestinal obstruction (2) air in the biliary tree and (3) the direct visualization of the gallstone. At operation, an





*Figure 1—Most common site for arrest of progress of gallstone within lumen of ileum.*

enterotomy is performed with removal of the stone the abnormal condition in the gallbladder region is not disturbed. It is better prophylactic surgery to remove gallstones from the gallbladder before these stones enter the intestinal tract.

The following case illustrates some of the afore-mentioned principles.

#### CASE REPORT

Three days prior to admission to the hospital a 67 year-old white woman experienced acute generalized abdominal pain associated with nausea and vomiting. She had had no bowel movement for 4 days. Past history revealed that she suffered from occasional constipation which was relieved by enema, and she also experienced periodic attacks of indigestion. She had a distended abdomen with generalized tenderness throughout, but most severe in the left lower quadrant. A mass the size of a grapefruit was palpated in this region. Pelvic examination revealed a frozen fixed pelvis with a mass, probably a fibroid uterus, extending up to a point about midway between the umbilicus and symphysis pubis. The roentgenologist reported "A

large mass-like shadow occupies the pelvis. The intestinal loops show fluid levels. A circular, homogeneous, calcium density is seen in the left lower quadrant. A calcified mesenteric node or a gallstone should be considered."

The patient was taken to the operating room 8 hours after admission, after adequate preoperative care and the making of laboratory studies. On opening the peritoneal cavity about 50 cc of green fluid exuded. A large uterine fibroid and two large multilocular ovarian cysts were encountered. Between the uterus and the left cyst, a loop of ileum had become trapped. The bowel proximal to this point was greatly distended. On freeing this ileum from the pelvic organs, a hard mass about the size of a golf ball was palpated within the lumen of the liberated ileum (fig 2). The fibroid and both ovaries were re-

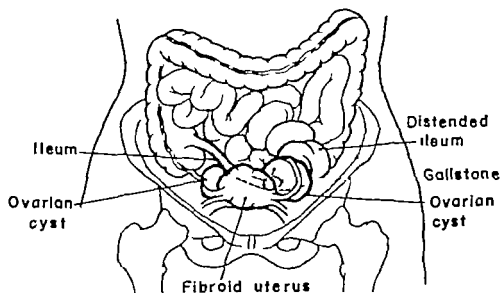


Figure 2.—Gallstone within lumen of ileum trapped between uterus and left cystic ovary

moved and an ileotomy was performed with removal of the gallstone.

Palpation of the gallbladder area through the operative incision revealed a mass with dense pericholecystic adhesions which was not disturbed. The incision was closed without drainage; primary healing followed. Pathologic reports confirmed the physical findings. The post-operative course was interrupted by pneumonia which responded slowly to treatment. The patient was discharged feeling well 7 weeks after operation.

#### SUMMARY

Cholelithic intestinal obstruction can be prevented if gallstones are removed before they enter the intestinal tract. Gallstones usually ob-

struct the lumen of the gastrointestinal tract in the region of the ileocecal junction unless they are stopped by some extrinsic factor prior to reaching this area. Treatment consists of longitudinal ileotomy of the antimesenteric border of the intestinal wall with transverse closure together with all the basic treatment required for intestinal obstruction.



# Hurler's Disease

## Report of a Case

RUDOLPH P. NADBATH, *Lieutenant Commander MC U S A*  
OTIS S. LEE, *M D*

HURLER'S disease is a complexity of skeletal and visceral changes usually associated with ocular manifestations. Thomson in 1900 was probably the first to note this condition. His patient was a twin. In 1908 when he saw the sibling of his first patient, he realized that he was dealing with a disease that had no counterpart in the literature and, although he did not publish his case reports, he designated this condition in the hospital records as "Johnny McL——'s disease." Hunter,<sup>1</sup> in 1917 was the first to publish a report of this disease. Hurler in 1919 described two more such patients, each displaying an unusual combination of anomalies, i. e., oxycephaly dwarfism and clouding of the cornea. Because she was one of the first to emphasize the combination of these signs, the disease is known as "Hurler's syndrome."

In 1923 Putnam and Pelkan made the first report found in the American literature. In 1930, Ellis, Sheldon, and Capon suggested the term "gargoylism" for this disease because the characteristic large head and grotesque facies of these patients resembled the gargoyles of the Notre Dame Cathedral. Binswanger and Ullrich in

1. M. N. Hospital, Portsmouth, Va.

1. Case 1 with the Department of Ophthalmology, University Hospital, Iowa City, Iowa.

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1933 introduced the term "dysostosis multiplex" into the German literature for this condition. Washington<sup>7</sup> in 1942 first used the term "lipochondrodystrophy" to indicate this disease. According to Straus, Merlies, and Reiser<sup>8</sup> who reviewed the literature of the world, only 63 patients had been reported up to late 1947. About one-third of these are inadequately described and doubt may be cast as to the validity of the diagnosis. About 107 patients have been reported to date.

### GENERAL DESCRIPTION

**Incidence.**—The disease affects persons of either sex and is about 35 percent more frequent in males than in females. The majority of the reported patients were Caucasians, only two Negroes<sup>10,11</sup> and two Chinese<sup>12</sup> having been reported. The occurrence of this disease in siblings was recorded in 32 instances by Hurler (1910), Bezdruk (1934) and others.<sup>13</sup> Consanguinity of parents was found on four occasions.<sup>14,15</sup> Because of its familial incidence and its developmental abnormalities, the disease is universally regarded as congenital.

**Physical manifestations.**—These patients are usually shorter than average for corresponding chronologic age, some being dwarfs. Their features are often described as coarse and ugly usually with dolichocephalic head and prominent supraorbital ridges. The ears are frequently large, relatively low in position, and retracted against the head. Deafness may be present. The root of the nose is depressed, the nares are broad and filled with purulent mucus. The lips are

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thick, the tongue is large and often protrudes through the open mouth. Harelip and cleft palate are not infrequent. The neck is short. Thus, and the hunching of the shoulder add to the appearance of the head resting directly on the torso. The thorax is large appearing to be in a position of deep inspiration. Often there is dorsolumbar kyphosis. The abdomen is usually large and protuberant with umbilical and/or inguinal hernia. Splenomegaly and hepatomegaly are often present. Lanugo may be found on the back. Flexion deformities of the extremities are frequent. There is pronounced limitation of extension, but with no interference with further flexion of the involved joints. The fingers, elbows, shoulders, hips, and knees are frequently affected in this manner. Coxa valga genu valgum, talipes equinovarus, pes planus, and pes cavus are often mentioned.

*Mentality*—The mentality of these patients has been variously reported as superior, normal or inferior, the majority of them being subnormal.

*Prognosis*.—These patients usually die before the twentieth year of life, although one autopsied case<sup>1</sup> was 29 years old at time of death. Death is usually from some intercurrent disease or cardiac failure. The nares being frequently occluded with purulent mucus, the cleft palate and the thoracic deformities often found in these cases make these patients vulnerable to pulmonary infections.

*Skeletal findings*.—Although the skeletal changes<sup>2,3,4,5</sup> are perhaps the most helpful single diagnostic findings, these deformities may not be very great. The roentgenograms of the bones may be normal during infancy, but later the bony deformities which are characteristic of the disease develop. The skull is usually enlarged with widened suture lines and a large anterior fontanel. The most typical skull deformity is oxycephaly although brachiocephaly and scaphocephaly are also reported. The forehead is prominent and is associated with heavy supraorbital ridges. The pituitary fossa is frequently elongated and shallow, but although it may be enlarged to twice its normal size, bony erosion is not seen.

The ribs are usually fixed in a horizontal position, are flared, and their distal portions show varying degrees of broadening. The clavicles are often massive and heavy. The shafts of the upper extremities are short and stubby exhibiting bizarre swellings of the central portions which taper toward the ends. It is this swollen tapering con-

<sup>1</sup> O. LEEHMAN, J. R. and SIVOLLY, J. A. *Dysostosis multiplex*. J. Bone & Joint Surg. 22: 171-175 Jan. 1940.

<sup>2</sup> CAPPEY, J. *Infantile X-ray diagnosis*. The Year Book Publishers Inc. Chicago, Ill. 1945. pp. 48-631-796.

figuration of the shafts of the tubular bones in the upper extremities which is the most diagnostic skeletal feature of the disease. In some patients the swelling of the central segments of the shafts is caused by cortical thickening, but in others it is caused by dilatation of the medullary canal. The distal ends of the femurs may appear normal. The proximal ends may show coxa valga or vara the femoral head may be deformed and demineralized and the acetabular cavities may be either shallow or deepened. Genu valgum is almost a constant finding. Kyphosis in the region of the twelfth thoracic and fifth lumbar vertebra is found in all severe cases. This deformity is caused by irregular growth and hypoplasia of the vertebral bodies, the affected vertebrae often being displaced posteriorly. Other vertebral bodies are delicate and narrow especially in the cervical region. This narrowing shortens the spine and contributes to the dwarfism. Fairbank<sup>22</sup> contributed a brief clear and pertinent discussion of the radiographic features of Hurler's syndrome which differentiate this condition from the Morquio-Brailsford syndrome.

*Ocular signs*—These are found in over three-fourths of the patient. Convergent squint was noted in four patients by Bindschulder and others.<sup>23,24</sup> Megalocornea was reported by Meyer and Okner. Buphthalmos with optic atrophy was found in two patients.<sup>25</sup> Two others are described by Jewesbury and Spence<sup>26</sup> as having prominent eyeballs. Huinink,<sup>27</sup> in reporting his case, stated that both optic nerves were swollen. Slot and Burgess described the disks in their case as red, vascular and congested. Refractive errors were measured in several patients, and these ranged from + to -8D. Engel<sup>12</sup> recorded the astounding determination of +37D in his reported second patient, one of two Chinese children. He failed to mention whether the patient was hyperopic or myopic.

Subnormal dilations of the pupils after the administration of mydriatics have been noted in four patients.<sup>12,28,29</sup> Helmholtz and Harring-

<sup>22</sup> FAIRBANK, H. A. T. 10. Gargoylism. From An Atlas of General Affections of the Skeleton. J Bone & Jt (Brit), 31B: 307-349, Ma 1949.

COMBES, P. C. and HILL, M. J. Dysosteosis multiplex (Hurler's disease) hyperostosis dysplasia (gargoylism): report of seven radiographs in 5 cases with review of literature. Arch. Ophth. 27: 637-654, Apr 1942.

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LEE, C. A. JR. et al. Hurler's disease associated with dysosteosis multiplex and Morquio's disease: report of case of the former. Arch. Ophth. 28: 357-363, Apr 1941; also, Tr Pacific Coast Oto Oph. Soc. 23: 107-117, 1940.

ton<sup>24</sup> recorded an instance of anisocoria. Opacity of the cornea occurs in about 75 percent of these patients.<sup>25</sup> When the corneal changes are present, they are pathognomonic of the disease. The changes usually appear before the age of 3 years and have been reported in which the corneas were already involved at birth. After the initial appearance, the opacities are permanent. On examination with focal illumination, the corneas are hazy and have a gray and gray appearance. Slit lamp examination shows the entire substantia propria to be uniformly speckled with gray or yellow gray slightly refractile points of varying size. These at first occupy the middle and deeper layers of the substantia propria. Later the entire depth of the substantia is involved. The epithelium may stain diffusely with fluorescein.<sup>26</sup> Bowman's membrane and the endothelium are not usually involved. Only one such patient in whom gray white points were found in Bowman's membrane has been reported. Brierley<sup>27</sup> found the cloudy opacities to occupy the central area of both cornea with the peripheral areas being only slightly involved. Furthermore the corneal involvement in his patient began in the anterior middle layers of the substantia and increased in density toward the posterior corneal surface. Engel<sup>28</sup> on the other hand, found the corneal opacities scattered throughout the substantia propria but most heavily aggregated in its anterior portion. Waardenburg<sup>29</sup> described numerous and smaller lines and spots in all depths of the parenchyma. It was Cockayne<sup>30</sup> who called the corneal changes a corneal dystrophy. Only three slit lamp drawings<sup>22, 23, 31</sup> of the corneal changes found in this condition have been found in the American literature.

Nystagmus has been described in a few patients. Although the visual acuity becomes reduced these patients do not become blind.<sup>32</sup> It is difficult to determine the exact visual acuity because of the age and/or the mentality of the patient. The corneal sensitivity appears to be normal. Sometimes the corneal opacity is so dense that details of the iris, pupil and lens cannot be clearly determined.

<sup>24</sup> HOSKINS M. J., and CORNELL F. C. Lichondrocytostrophy dystrophic in type. II the disease pathologic changes in cornea in 2 cases. *Arch. Ophthalm.* 31: 205 Oct 1944.

<sup>25</sup> SHUMWAY W. F. et al. of signs from with aplachmaeomegaly. *Proc. Roy. Soc. Med.* 27: 1002-1007 J. Dec 1934.

<sup>26</sup> BERLINER M. L. Lipid terribile of Hurler's syndrome (gargoylism or dystrophic multiplex). *Arch. Ophthalm.* 31: 97 1947.

<sup>27</sup> WARDENBURG P. J. Ueber Dystrophia multiplex II hereditäre distale Korneal dystrophie. *Ophthalmologica* 39: 707-712, Mar 1940.

<sup>28</sup> COCKAYNE E. A. Gargoylism (chondroosteo-dystrophy hereditariaeomegaly) (see Hurler's) 2 brothers. *Proc. Roy. Soc. Med.* 29: 114 117 Dec 1936.



merus is out of all proportion to the size of the shallow glenoid cup and the joint capsule is extremely lax. The fibrocartilaginous glenoid labrum adds some depth to the glenoid cavity but it is loosely supported anteriorly by the attached capsule and glenohumeral ligaments. Bony anomaly of the anterior glenoid rim or of the humeral head, congenital defect of the glenoid labrum, or structural inadequacy of the subscapularis muscle have been noted as possible predisposing factors in recurrent dislocation.

Most observers believe that recurrent dislocation of the shoulder is the result of an initial ordinary shoulder dislocation with subsequent incomplete healing of the soft tissue injury caused by inadequate immobilization. Capsular tears have been demonstrated as a result of ordinary shoulder dislocations. The original theory of mechanism of recurrent dislocation was repeated displacement of the humeral head through these unhealed capsular defects. More recently this has been supplanted by the concept of recurrent displacement into a distended capsule or a capsule stripped from its attachment to the glenoid rim without any herniation of the humeral head.

Bankart has insisted that the recurrent type of dislocation of the shoulder is a separate entity and bears no relationship to the ordinary type of dislocation. The latter variety is usually caused by an abduction and external rotation force with leverage of the head from the glenoid cavity between the subscapularis muscle and the head of the triceps. Bankart contended that the recurrent type was caused by a direct anterior propulsion of the head of the humerus or a posterior thrust against the elbow with the latter close to the side of the body. He believed that in the ordinary variety of dislocation the capsular tear always healed and that habitual dislocation did not result. In the true recurrent variety he stated that the glenoid labrum and its attached capsule were stripped from the anterior and inferior glenoid margin. Because the labrum is fibrocartilaginous it does not reattach to the bony margin of the glenoid and this stripping of labrum and capsule increases the mechanical inadequacy of the shoulder joint so that subsequent repeated dislocation occurs without significant trauma.

Still another factor contributing to habitual dislocation is a defect in the posterolateral surface of the humeral head which is noted in many patients. This defect was originally reported by surgeons who performed resection of the humeral head in the treatment for recurrent dislocation and it was found so frequently that it became known

as the "typical defect" Bankart however disregarded this bony change and considered it an incidental finding and of no etiologic significance in recurrent dislocation. He was convinced that the "typical defect" was the separation of the glenoid labrum. Most writers on the subject have considered the defect in the head to be the result of fracture at the time of the original dislocation or a pressure defect caused by the repeated contact of the head against the glenoid rim during the recurrences. Taverier<sup>2</sup> and other French observers believed that the defect was a congenital bony anomaly of the humeral head and was the underlying cause of habitual shoulder dislocation. Eyre-Brook recently studied an autopsy specimen and noted that the defect in the head of the humerus fitted perfectly when placed against the rim of the glenoid cavity.

## ROI NEUROGRAPHIC FINDINGS

There have been many studies of the roentgenographic changes in patients with recurrent shoulder dislocation. Schultze and more recently Pilz have emphasized the importance of special techniques to demonstrate abnormalities of the humeral head and the glenoid margin. The most consistent findings have been a grooving or notching of the posterolateral portion of the humeral head and the frequent presence of a vertical line of sclerosis at the margin of the groove. Flattening of this area of the head or of the greater tuberosity is also a common observation. Cystic changes have been reported in the head of the humerus and periosteal proliferation at the glenoid margin has been noted. Occasionally loose joint bodies are encountered. Grooving of the head of the humerus sometimes results in a marked deformity which is referred to as "hatchet head."

There is disagreement concerning the origin of these roentgenographic findings. The French writers believed that the deformity of the head of the humerus was on a congenital basis whereas Hill and Sachs<sup>1</sup> from a study of 119 patients with shoulder dislocation, believed that the defects were caused by compression fractures at the time of the initial injury. Over two-third of their patients showed evidence of

T. FRISCH, L. Recurrent mutation of boulder. (Read at the Congress of the French Orthopaedic Society Oct 11 1979) J Bone & Jnt Brg (N) Notes Section French Orthopaedic Society 12 45 401 Apr 1979

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# TRANSPORTATION AND DISTRIBUTION OF WHOLE BLOOD FOR THE PACIFIC THEATER

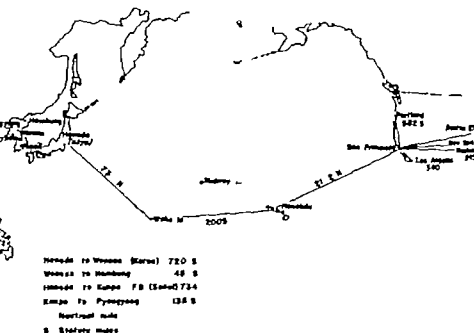


Fig. 1

transport over 6,000 miles from the place of collection, the blood was being given to war casualties (fig. 1).

The Military Air Transport Service is responsible for transportation and re-icing of the blood en route. The blood is consigned directly to Tokyo without transfer on a plane stopping in Honolulu and Wake for refueling and re-icing when necessary. A team from the 406 Medical General Laboratory Blood Bank Shipping and Receiving Section meet the plane at Haneda Air Force Base and transports the blood to refrigerators in Tokyo. There it is inspected, re-packed, and read for shipment to Korea. All blood shipments from the 406 Medical General Laboratory Blood Bank are accompanied by a courier who delivers it to the final destination. Table 1 shows the itinerary and temperature reports of such a shipment. The 406 Medical General Laboratory Blood Bank collects blood from donors in Japan, most of which is used in the United Nations Military hospital located there. The organization for distribution is shown in figure 2.

TABLE 1—Its errary and temperal re report

Location	Time	Temperature inside refriger- ated container	Ambient temperature	Remark
	5 Nov	Degrees Fahrenheit	Degrees Fahrenheit	
Tuske AFB	2200	42	40	iced for shipment
	2230	42	41	Taken to freight terminal.
	2345	45	60	Loaded on plane
Honolulu	6 Nov			
	0100	48	60	Take-off
	0600		74	
	1200		78	Arrived Honolulu
	1230	50	81	Re-icing on airstrip in Honolu- lu.
Honolulu	1445		81	Re-loaded on plane
	1815	45	82	Take-off
	2200		60	
Wake	7 Nov			
	0245	48	78	Arrived Wake. Ice bout one-half melted, not re-iced here
Haned AFB				
	0900	43	68	Take-off
Tokyo	1440		66	Arrived Haneda. Blood loaded on truck for trans- portation to Tokyo.
Tokyo	1530	48	68	Blood placed in refrigerator
	2100		70	Re-iced, placed on truck for transportation to Kure
Tachikawa AFB				
	2200	45	43	Arrived Tachikawa AFB Blood placed in commu- nary refrigerator
Ashiya	6 Nov			
	0900	45	55	Blood loaded on plane
Ashiya	0900	48	66	Arrived Ashiya. Blood left on plane
Wooman	1400	48	60	Take-off
	1630	45	80	Arrived Wooman.
Yong-Po	1700			Take-off
	1730		60	Landed Yong-Po.
Hamburg	1800		60	Blood loaded on ambulance for transportation to Ham- burg
	2100		56	Arrived 121 Medical Evacua- tion Hospital, Hamburg Blood placed in ice boxes.

Refrigerator

Of the many thousand bottles of whole blood shipped to Japan for the use of war casualties only two have been broken. The breakage was caused by defective bottles and not by careless handling. All blood is handled with exceptional care. Because of the perishable nature of blood and the dire need for it in the treatment of war casualties, it receives top priority. The efficiency of the Armed Services Blood Program has been a major contributory factor in reducing the mortality of war casualties.

No reports of reactions caused by incompatibility from the use of proved group O whole blood have been received. The allergic and pyrogenic reactions are estimated at less than 1 percent. It is difficult to get accurate reports of reactions from the field, but the above estimates were made from observations of blood being used and verbal reports of medical officers interviewed in the field. In the majority of instances when used in an evacuation hospital or hospital ship it is

Louvers were constructed because they overcome the stroboscopic flicker associated with fluorescent lighting. These consisted of five strips of 16-gage galvanized tin .48 by  $1\frac{1}{2}$  inches. These were cut half way through with a bandsaw at intervals of  $1\frac{1}{4}$  inches. Nineteen strips,  $1\frac{1}{2}$  by  $1\frac{1}{2}$  inches, were cut and sawed in like manner. These were fitted together to form a framework of  $1\frac{1}{2}$ -inch squares. A small bit of solder was applied to the corners of each square to increase rigidity. The louvers were installed in the finished fixture by attaching a hinge at the sixth short strip from each end and retaining it in position by two  $\frac{1}{4}$  inch strips suspended from the top of the fixture. This allowed the louvers to be lowered for cleaning and replacement of burned out tubes (fig. 3).

The ballasts come either in 2- or 4-tube assemblies. Each two 40-watt fluorescent tube assembly requires a 2-tube 40-watt ballast. It was found, for our purpose that a 4-tube ballast was easier to wire. Each ballast was accompanied by a wiring diagram which had to be followed implicitly. The position of placing the ballast must be left to the one who makes the fixture because much depends on the position of the fixture when attached. It may be desirable to conceal the ballast entirely by making an overhead receptacle for it and having the wires leading to the fixture come through a pipe suspension for the hanging fixture. Because our ceiling was low the fixture was placed close to the ceiling and as one side of the fixture would never be noticed the ballast was attached to the fixture on that side.

The tube holders were fastened to each end of the fixture. It was found more practical to place two of the starter retaining holders on one end of the fixture and two on the other end to facilitate wiring. At this point the fixture was ready for painting. After painting the surface with zinc chromate, a flat white paint was used. A finishing coat of white enamel is best as it gives a soft reflected light without glare.

#### SUMMARY

Greater protection must be afforded to the eye-sight of those who work with small objects in a limited field of vision. With the diminished number of dental officers and the presence of the constantly increasing work load it is important that their vision be protected. In future planning of dental clinics advantage should first be taken of natural sources of light and then they should be equipped with adequate artificial light.



# Psychologic Reactions to Winter Arctic Conditions

JEROME G. RACKER, *Lieutenant Colonel MHC U S A.*

THE observations summarized in this article were made when I accompanied an Army Medical Test Team to an arctic area during the winter of 1948-49. They are based on a study of the experiences of a group of soldiers during two winter months of arctic service. The severity of the cold and wind was not the chief cause for complaint among the soldiers. Because none of the men had ever experienced severe cold before, they were, at first apprehensive and somewhat fearful of it but as they gained experience in working in the cold, and as they became conditioned to the severity of the climate they complained less. This suggests that all troops departing for arctic assignments might receive a conditioning course in which they would be exposed to the type of climatic conditions they would encounter on reaching the locale of the assignment. This course would dispel fear of the severe cold, and prepare the soldiers for extreme changes in climatic conditions.

All of the soldiers of the Team were, however concerned with the isolation attending their assignment. They did not believe that the recreational facilities available to them were sufficient to dispel the depressing effects of the isolation. Added to their concern over what they considered poor recreational facilities was their lack of acceptance of their housing. The cold was important from a psychologic standpoint primarily because it intensified the isolation. In the arctic environment, soldiers are unable to move about with the ease which is common in more temperate climates. Outdoor group socializing experiences did not exist for the men of the Test Team and, when they were not working or walking between one building and another they were, as a rule indoors. Here they were dissatisfied with the recreational facilities afforded them and as a result there was a lowering of morale.

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Formerly Psychiatry and Neurology Consultants Division, Office of the Surgeon General, Department of the Army now assigned to Psychological Warfare Division, Office of the Assistant Chief of Staff G3, Department of the Army

The severe cold had other indirect psychological effects. Although the special clothing issued to the men for the most part, kept their bodies warm, protection of the face was inadequate and it was not possible for the men to work outdoors for prolonged periods without going indoors at intervals to get warm. This made working difficult reduced the soldier's productivity and limited him to an area near a building tent or vehicle where he could get warm. Also, dexterity of the fingers was reduced because of the bulky mittens which the men were required to wear to prevent freezing of the hands. This, at times, resulted in frustrating experiences for those who had to perform tasks requiring the use of their fingers. An element of insecurity existed in the soldiers' minds in that they had no confidence in the long range protection afforded by their special clothing chiefly because of the occurrence of frostbite of the face.

Working conditions were made difficult also because of the destructive effects of the cold on motor vehicles. As in other military field conditions, efficient operation of motor vehicles is necessary for the successful accomplishment of a mission and relates to the morale of the soldier at work. Because of exposure of the vehicles to the severe cold wind, and infiltration of fine particles of snow motors operated with great difficulty and broke down frequently.

As in all other military situations, good officer leadership under arctic field conditions was important. Because of the isolation and the additional hardships and possible dangers imposed by arctic field conditions, the soldiers, more than ever, looked to their commanding officer to provide for their welfare. It appeared that as much as possible the commanding officer of the Test Team provided his soldiers with the kind of leadership his group required. Under the more difficult field conditions, he gave them more considerate and individualized attention than he might have given under more favorable conditions. The men believed that their commanding officer was concerned with their welfare and that he was doing as much as he could for their comfort. The commanding officer worked with the men in performing the more arduous tasks and participated in difficult manual labor from time to time. This impressed the men and sustained their morale in the face of adversity.

Morale was fairly good because the men knew that their situation was temporary and that they were to be sent home after about 6 months. Had they been required to serve for 18 months or 2 years the morale might have declined after the first few weeks. Even during their temporary assignment the soldiers at times became tense and irritable and complained about the living conditions lack of recreational facilities and frustration which they met in attempting to perform tasks in rigorous climate to which they were unaccustomed.

Personality type in itself did not appear to be related to good or poor personal adjustment during the arctic operation. In a conversation with Sir Hubert Wilkins, the arctic and antarctic explorer he stated that he did not believe that any special type of personality was required for good personal adjustment in the Arctic just an "average fellow." He stated further that he thought the average, healthy man had no trouble getting along in the Arctic. Successful personal adjustment of the soldier appeared to be most highly correlated with the stability of his personality and his successful record of performance as a soldier prior to his departure for the Arctic. The soldier who had a record of efficient performance, combined with a stable personality did an efficient job and made the best adaptation to the arctic assignment especially if he had had successful military experience in the field. The soldier whose military record was poor adapted poorly during the arctic operation.

All of the soldiers of the Team were of the Army Medical Service and most had been trained in military occupational specialties which did not require extensive field experience and training. Because most of the men found it necessary to work outside their occupational specialties most of the time several of them were considered by the commanding officer to have performed poorly not adapting themselves to the rougher field work as readily or as efficiently as those who had had field experience.

The soldier who was rated as having done the most efficient job during the arctic winter had an outstanding combat record and with one minor exception, a consistently good performance as a soldier throughout his military service. Another soldier whose performance was superior in the Arctic was a sergeant who, at the time of his selection for the project objected strongly to his assignment. Despite his initial uncooperative attitude his record of more than 20 years as an efficient soldier much of it in the field was continued with his efficient performance during the temporary arctic detail.

The most inadequate soldier of the Team was one who had the poorest military and civilian record. Assumedly he performed no worse in the Arctic than he had performed on his usual military assignment and on civilian jobs. An immature soldier with a military record of inefficiency alcoholic habits, and poor emotional adjustment continued his usual poor performance and adjustment while a member of the Team. The alcoholic habits of another enlisted man resulted in his evacuation as a result of an injury sustained in a fight with a fellow soldier. He had been an efficient worker until the period of drunkenness which resulted in the fight.

In assignments to arctic or to other stations where the field conditions are rigorous the emotionally stable physically healthy soldier



will make a satisfactory adaptation to his environment provided attention is given to his *psychologic* needs. In addition to *primary* or *biologic* need such as food, water and oxygen, man, whether he be soldier or civilian, has other needs of which he is more conscious and which are strongly related to the manner in which he adapts to his environment. Affection, recognition, security, freedom from fear and self accomplishment are some of the principal *social* needs which man constantly strives to attain to make him proficient. Satisfaction of these needs is strongly related to motivation and hence, to the manner in which a person performs an assigned task.

In the assignment of military personnel to arctic or other field conditions, several of the soldier's strongest social needs should be met if maximum efficiency of performance is to be maintained. Primarily the soldier should be exposed to good leadership in his organization. This implies that he will receive all possible attention to his welfare and comfort. Good leadership thus contributes to the fulfillment of the soldier's needs for affection and security. Whenever possible the soldier should be assigned to the military occupational specialty for which he has been trained. If he has been trained for a task and has had experience with a particular job, usually he can perform this assignment better than any other. The soldier is happiest when he is able to excel in whatever he is doing and to satisfy to a high degree his need for self-accomplishment.

Whether soldiers are assigned to arctic regions or to any other unusual environment they should receive a course which will, to some extent, prepare them for the conditions which they are to encounter. This, to a high degree, overcomes the soldier's fears of the unknown and gives him a greater feeling of security. The soldier's clothing and other equipment should be designed to protect him against the hazards which he will encounter. This provision also serves to dispel the soldier's fears and contributes to the fulfillment of his need for security.

The successful adjustment of the soldier under rigorous field conditions, depends, to a great degree, on how he is treated after he encounters these conditions. That field conditions in a cold climate in themselves, do not produce emotional breakdowns among soldiers is suggested by the fact that among American troops in Alaska, during more than a 2 year period, the incidence of neuropsychiatric conditions was lower than among the troops in any other Army theater outside the continental limits of the United States.

Emotional problems encountered among soldiers under arctic field conditions do not appear to be different from those encountered under field conditions accompanied by other climatic extremes. Furthermore no particular personality type performs with greater efficiency under arctic field conditions than it would under field conditions in other climatic extremes where leadership, housing, recreation, isolation, and other variables are the same. The soldier who is able to perform efficiently in one type of climatic extreme with few exceptions, should be able to perform in the same manner in another.





# Acute Intermittent Porphyria

## Report of a Case

DELPHOS O. COFFIN, *Commander MC U S N*

HOWARD L. KUHIL, *Lieutenant junior grade MC U S N R*

IN THE past decade an increasing number of cases of true porphyria have been recognized and reported in the literature. The majority of these reports deal mainly with the gastrointestinal manifestations of the disease and their differential diagnosis. Our case is reported because of its almost pure central nervous system involvement.

The basic cause of porphyria is an "inborn error" or deficiency in porphyrin metabolism. A congenital and an acute intermittent type are recognized. Congenital porphyria may be acute or chronic. The acute congenital type appears early in neonatal life or early infancy and is manifested by epidermal photosensitivity, the appearance of blebs and necrotic areas on the skin, endochondral staining of bones, anemia, splenomegaly, and hepatomegaly. The chronic congenital type is characterized by an onset at from 40 to 60 years of age, epidermal photosensitivity, blebs on the face, and porphyrinuria.

Acute intermittent porphyria is now recognized as a chronic, inherited, Mendelian dominant metabolic disorder. It is characterized by (1) gastrointestinal disturbances, i. e., pain, nausea, vomiting, constipation, and weight loss; (2) polyneuritis, mental symptoms and/or paralysis; (3) fever and leukocytosis; (4) arterial hypertension; (5) tachycardia and electrocardiographic changes; and (6) porphyrinuria.

The porphyrin compounds are red pigments occurring in nature in plants and animals. They have been found as basic components of hemoglobin, myoglobin, chlorophyll, catalases, and cytochromes. These substances are concerned with cellular respiration. The porphyrins themselves are synthesized in the animal body in the form

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U. S. Naval Hospital, San Diego, Calif.

W. TAO, C. J. I. COOKE, B. L.: *Textbook of Medicine*, 13th edition, W. B. Saunders Co., Philadelphia, Pa., 1947, pp. 724-728.

C. O. L.: *Porphyria*, Surg., Gynec. & Obst. 90: 16, 2, no. 1950.

tion of hemoglobin. In this process varied amounts of protoporphyrin are not utilized and are converted to coproporphyrin and excreted as such in the urine and feces. This is present in normal persons and in patients affected with porphyria. These amounts may be increased in such diseases as carcinoma, peripheral neuritis, Hodgkin's disease, beri beri, cirrhosis, infections, and pancreatitis.

#### CASE REPORT

A 35-year-old man was admitted to the hospital on the dental service complaining of a painful swelling of his right mandible which had followed the extraction of several teeth 1 month previously. Physical examination on the dental service revealed a tender swelling of the right side of the face extending from the inferior border of the orbit to the inferior border of the mandible. There was no temperature elevation, the blood pressure was 150/90, and the pulse was 90. He was immediately placed on penicillin and crystalloids therapy. He was delirious throughout the night, was observed in a convulsive seizure the following morning and was obviously out of contact with his surroundings.

Following consultation, he was transferred to the neuropsychiatric service where he appeared generally disheveled, was perspiring profusely, was tremulous and mentally confused. He complained of annoying visual hallucinations consisting of Lilliputian human figures. He was disoriented as to place and time, was generally uncooperative, resistive, and negativistic. Neurologic examination revealed severe generalized tremors, moderately severe paresis of both lower extremities, unsteadiness, jaundiced scleras, and hyperpigmentation of the skin. Shortly after his admission to the ward he was observed in a brief epileptoid seizure consisting of a fall, a cry, tonic and clonic movements, and later urinary incontinence. The entire seizure lasted 30 seconds. Following urinary incontinence it was noted that the patient's pajamas were stained a dark purple. The temperature had risen rapidly to 102° F rectally. Lumbar puncture, cerebrospinal fluid studies, and skull roentgenograms revealed no abnormal findings.

The following morning the patient was noticeably less tremulous and less confused but still quite unsteady and weak. He was severely jaundiced. A specimen of urine was obtained and half the specimen exposed to direct sunlight. After 30 minutes exposure, the exposed urine was distinctly darker than the protected portion. The laboratory reported the urine to be dark amber in color and cloudy with 100 mg of albumin per 100 cc, numerous granular casts, an occasional red blood cell, and 10 to 15 white blood cells per high power field. The Watson-Schwartz test for porphobilinogen was strongly positive. Other laboratory studies showed 1 mg of urea nitrogen per 100 cc

of blood, an icteric index 16 a red blood cell count of 4,200,000 a white blood cell count of 7,000 with a normal differential count and a 2 plus standard blood Kahn test. Cephalin flocculation and thymol turbidity were within normal limits but repeated glucose tolerance curves showed a tendency to rapid increase in the blood sugar level with a very slow reduction and during the first test 2 plus sugar was noted in both the second and third urine specimens.

Electroencephalographic tracings first showed changes suggestive of an irritative high frequency activity in the right parietal lead but was considered within normal limits. An EEG 3 weeks later revealed very fast waves and was considered indicative of a diffuse type of cortical abnormality consistent with a toxic encephalitis.

On the third hospital day the diagnosis of porphyria, acute intermittent type, was established. The treatment consisted of penicillin, closed ward nursing care, riboflavin niacin and dental surgery. The patient was given 1,000 mg of mephenesin q. i. d. to control his severe tremors. The patient began to improve almost immediately under treatment but during the first 4 or 5 days his mental condition was unstable. He was often extremely restless, agitated, and actively hallucinated in all spheres, but a few hours later would be in a good contact quiet and cooperative. He soon became able to rise from the floor without assistance, was much steadier on his feet and was less tremulous. Following the first week of treatment he was alert active and mentally clear. Only a moderate tremor of his outstretched fingers remained. His sleeping eating and bowel habits improved greatly.

On his fourteenth hospital day urine specimens were negative for porphobilinogen for the first time. Steady improvement continued so that after 3 weeks in the hospital the patient was exercising voluntarily was sociable pleasant cooperative and was more interested in his personal hygiene. During his convalescence he was referred to the clinical psychologist and was studied by a battery of tests which included the Wechsler Scale for Memory Wechsler Bellevue Adult Intelligence Scale Bender-Gestalt and the Shipley Hartford tests. There was no impairment of memory for remote or recent events. The full scale intelligence quotient equaled 100. There was no evidence of gross organic involvement. There was evidence of an impoverished cultural and educational background with no impairment of intellectual functioning. Other examinations included the eosinophilic response test which showed a 14 percent fall in circulating eosinophils following epinephrine injection. Special studies made at the Scripps Metabolic Clinic Laboratory revealed the absence of porphyrins in urine collected on the date of discharge.

Past history revealed that the patient had been admitted to another hospital in 1944 and following 3 months hospitalization was discharged with a diagnosis of chronic hypertrophic arthritis. He was discovered to have had a syphilitic infection about 1 year prior to the present admission and was treated with 6 million units of penicillin by a local physician. Although the patient gave a history of chronic constipation, no history of abdominal cramps or cramps could be elicited. He had never had a convulsive seizure prior to the present hospitalization. He volunteered the history of frequently voiding dark colored urine associated with alcoholic ingestion, exhaustion, and infection. He had always been considered as the one person in the family who "couldn't hold his liquor." One older brother is said to have similar symptoms but has refused to consult a physician.

The patient was discharged on the twenty-eighth hospital day symptom free and was advised to seek treatment for his syphilitic infection privately to abstain from alcoholic excesses, and to avoid overexertion.

#### DISCUSSION

A noteworthy feature of this case was the apparent diffuse involvement of the central nervous system with the acute psychotic episode, convulsions, hallucinations, and paresis. It may be possible to draw a definite conclusion concerning the pathophysiology of this disorder. Porphyrin applied topically to smooth muscle creates spasm.<sup>1,2</sup> The basic mechanism for this spasm is unknown. It may be that the fundamental changes occurring in the nervous system are caused by (1) contact of excess porphyrins with smooth muscle, creating spasm with resulting anoxia to the central nervous system cells or (2) direct anoxia of the central nervous system cells resulting from high porphyrin levels in the blood. The latter is more likely because the porphyrins are so closely related to cellular metabolism and an excess creates tissue anoxia with the result that neurones are the first to suffer. Peters reports electromyographic changes consistent with a patchy degeneration of motor nerves in porphyria. The essential postmortem changes reported in fatal cases are best shown in the anterior horn cells of

WILSON, C. J. The Porphyrins and Their Relation to Intoxication. *Porphyria*. Oxford Medicine, Vol. I, Part II. Oxford University Press, New York, N. Y., 1939, 329-341.

IMMERSCHER, K. and KNOX, C. P. Porphyrins in health and disease. *Physiol. Rev.* 20: 416-449, Jan. 1940.

RANK, E. V. and HOWELL, W. H. Photodynamic action of bismuth porphyrin. *Am. J. Physiol.* 61: 362-377, Mar. 1923.

PETERS, G. A. Acute porphyria: report of two cases with electrical studies in vivo. *Ann. Int. Med.* 24: 1237-1243, June 1945.

the spinal cord. These show perinuclear chromatolysis, cellular swelling and vacuolization of the cytoplasm.\*

The electroencephalographic record at the height of the disease showed only rapid waves, but a tracing 3 weeks later was typical of a toxic encephalitis. There was an associated impairment of glucose metabolism.

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\* FULLER, R. H.: Acute porphyria. *Armed Forces Med. J.* 1: 414-417 Feb 1950.

DENNY-BROWN, D., and SCHEER, D.: Changes in central nervous system in acute porphyria. *Brain* 68: 1-16, M. 1945.

\* MASON, V. R., COCHRAN, C., and ZIEGLER, E.: Porphyrins in human disease. *Medicine* 12: 255, 1933.

\* DUKAKIS, A. B., and WATSON, C. J.: Central nervous system in porphyria. *J. Neuropath. & Exper. Neurol.* 4: 68-76, Jan. 1945.





search into field apparatus, disinfectants, insecticides, water purification method and other subjects related to practical hygiene. A mobile Army health team, which is based at the school, tours the United Kingdom giving demonstrations and lectures and showing films to units of both the Regular and Territorial Armies. Certain civilian organizations make use of the school including the Civil Defence Staff College and the London School of Hygiene and Tropical Medicine. Arrangements are also being made for cadets of the Colonial Administrative Service to attend for instruction before taking up their first overseas appointments.

The third institution is the Far East School of Hygiene at Singapore which, although small, gives courses similar to those at the Army School of Health, for British personnel serving in the Far East for Gurkha troops, and for locally enlisted troops. In other overseas commands local demonstration grounds are set up by the hygiene companies and short courses of instruction are given on problems appropriate to the command.

The pattern of health education which it is hoped to achieve is that the recruit will receive lectures on elementary hygiene particularly personal hygiene at his training center. This instruction will be reinforced by films on communal and personal hygiene and related subjects prepared by the Army Health Organization. The trained soldier will receive a set program of lectures from his medical officer each year. It is hoped soon that the corporal will receive a short course of instruction at the Army School of Health before he becomes a sergeant. The young regimental officer will receive a course at the school because Army health questions are included in his promotion examinations. The senior officer will be able to attend refresher courses. It is hoped also that captains will receive a short course of instruction before promotion to major.

In addition special arrangements are made for lectures and films to be given to troops while on troopships. The textbooks on the subject have been rewritten. A "Handbook of Army Health," an elementary publication for all arms is in print and will appear shortly. A "Manual of Army Health," a technical work for Army health specialists is being prepared, and a small pamphlet entitled "Your Health and You" which is to be handed to each soldier when going abroad is in print. A similar publication for families going overseas is in preparation.

#### MEDICAL CLASSIFICATION AND PERSONNEL SELECTION

World War II demonstrated the importance of achieving the maximum use of manpower both in the services and on the home front. Put briefly the problem is to get the man into the employ

ment for which his physique, temperament, intelligence aptitude and training make him most suitable. Temperament intelligence aptitude, and training are covered by the personnel selection procedure which is organized by a special branch of the Adjutant General's department. Personnel selection officers can readily refer soldiers to Army psychiatrists when this is thought to be advisable. As far as physique is concerned the Pulheems system of medical classification has been evolved. This important subject has already been covered by Campbell.\* This system aims at the production of a medical standard for each soldier which is based on the correlation of his actual physical condition with the physical attributes required in his particular Army trade or employment.

### RESEARCH

Research is carried out at the Royal Army Medical College and at the Army School of Health. In addition more particularly for personnel research problems, a pool of physiologists is maintained who can be attached to service research institutions carrying out investigations which require the service of physiologists. Committees are in existence which link the Army Health Organization with the Medical Research Council and other civilian research bodies. Another committee links the Industrial Health Organization in the services with the medical staff of the Factory Department of the Ministry of Labour.

### ORGANIZATION IN WAR

The organization in war follows the same general principles as in time of peace. At all levels senior administrative medical officers have specialists in Army health on their staffs. An important feature of the organization in war is that in areas where there are special health hazards the divisional staff may be augmented to include a Deputy Assistant Adjutant General Health. This appointment is filled by an executive staff officer not a member of the Royal Army Medical Corps. His duty is to insure that all personnel within the formation comply with orders relating to the maintenance of health. Forces in the field are provided with an appropriate quota of field hygiene sections commanded by nonmedical hygiene officers and field hygiene companies commanded by Army health specialists. Laboratory facilities are supplied by mobile hygiene laboratories. When the area of operations is malarious malaria field and base laboratories are provided. These are commanded by Army

\* CAMPBELL, A. F. Assessment of physical fitness for service in the British Army. U. R. Armed Forces Med. J. 1: 15-7, 1953 Dec. 10-9.

health specialists and have a staff of malarialogists and entomologists. Each can set up a central entomologic laboratory and provide two or three malaria survey teams. A malaria control company which is responsible for the control of local labor recruited for antimalarial work may also be provided.

#### CONCLUSIONS

The approach to health in the British Army is directed toward the attainment of positive health in the widest sense of the phrase. The campaign to achieve this end is based on (1) intensive education at all levels (2) health discipline to enforce measures essential to health and (3) the provision of a corps of efficient, fully-qualified technical personnel continually striving to raise standards and always alert to ascertain new problems and suggest the means of dealing with them.



# New Medical Set-up for Department of Defense

THE SECRETARY OF DEFENSE

WASHINGTON

JUL 11 1949

Memorandum for The Secretaries of the Military Departments  
The Assistant Secretaries of Defense  
The Joint Chiefs of Staff  
The Chairmen of Boards and Committees of the Department of Defense  
The Directors of Offices OSD

Subject: Establishment of the Armed Forces Medical Policy Council

The attached directive establishes, effective as of this date, within the Office of the Secretary of Defense an Armed Forces Medical Policy Council with the membership, authority, duties and relationships as set forth in the directive.

Effective this same date, the Office of Medical Services and the Armed Forces Medical Advisory Committee are abolished and all personnel, property, funds, records and unfinished business of such office and committee are transferred to the Armed Forces Medical Policy Council.

All duties and responsibilities of the Director of Medical Services and of the Chairman of the Armed Forces Medical Advisory Committee not provided for in and not inconsistent with, the provision of the attached directive, are assigned to the Chairman of the Armed Forces Medical Policy Council.

Secretary of Defense directives of 12 May 1949 and 20 July 1949 concerning the Office of Medical Services and directives of 9 November 1948 and 30 April 1949 concerning the Armed Forces Medical Advisory Committee are hereby rescinded. All other official action papers on medical and health matters executed by or in the name of the Secretary of Defense, the Director of Medical Services and the Armed Forces Medical Advisory Committee remain in full force and effect.

All agencies of the Department of Defense shall keep the Armed Forces Medical Policy Council informed of such of their programs and policies as will be of interest to the Council and shall furnish the Council such information and assistance as it may require in the discharge of its responsibilities.

G. C. MARSHALL

# Directive for the Armed Forces Medical Policy Council

1 1 1

Pursuant to the authority vested in the Secretary of Defense by the National Security Act of 1947, as amended thereunder, and by the authority established by the National Security Council, the Secretary of Defense hereby establishes an Armed Forces Medical Policy Council (hereinafter called the "Council") which shall report directly to the Secretary of Defense and in order to define the authority and duties of the Armed Forces Medical Policy Council and to define the relationships of the Council with the Military Departments and other agencies of the Department of Defense, it is hereby directed as follows, effective as of the date of signature

## I MEMBERSHIP OF THE COUNCIL

The Council shall be composed of a civilian Chairman, who shall be a doctor of medicine, the Surgeon General of the Army, the Surgeon General of the Navy, the Surgeon General of the Air Force who shall act for and represent their respective Departments, and three civilian members who with the chairman shall be appointed by the Secretary of Defense having been selected from among national authorities in medical and health fields of endeavor. The Deputy Surgeons General of each Department shall serve as alternates for their respective principals with plenary powers. The Chairman with the approval of the Secretary of Defense, may appoint a Vice Chairman who shall, in the absence or disability of the Chairman, act for and exercise the powers of the Chairman. In the absence of the duly appointed Chairman and Vice Chairman, the Secretary of Defense will designate a Council member to act as Chairman.

## II AUTHORITY

A. *Authority of the Council*—Within its jurisdiction as further defined in this Directive or as may be further directed by the Secretary of Defense, the Council shall be the principal agency of the Secretary of Defense responsible for performing the duties set forth in Section III below. As such, the Council when majority agreement is obtained, except when formal appeal is presented as provided by Section II C, is authorized on matters within its jurisdiction, to issue directives in the name of the Secretary of Defense to implement the policies and decisions of the Council and to supervise their execution.

*B Authority of the Chairman.*—The Chairman shall have authority to take executive action in consonance with approved plans, programs and policies of the Council. The Chairman of the Council may without being relieved of his responsibility therefor perform any of his duties with or through the aid of such members or officials of the Council as the Chairman may designate.

The Chairman, after consultation with the Council and subject to the policies prescribed by the Secretary of Defense, is authorized to establish such continuing or temporary committees as may be necessary to conduct studies, assemble information, make recommendations, and otherwise to assist in carrying out the responsibilities of the Council.

*C Appeals from Decisions of the Council.*—With respect to any decisions of the Council, a dissenting Council member representing a Military Department may initiate for submission by the Secretary of the Department represented by the member in question, an appeal therefrom to the Secretary of Defense. Prior notification of any action shall be given to the Chairman and other members of the Council. In the event the Chairman, or a member not representing a Military Department is not in agreement with a decision of the Council, after prior notification to other members of the Council he may present his recommendations to the Secretary of Defense. In event of the presentation of formal appeals final action will be taken by the Secretary of Defense.

### III DUTIES

*A Duties of the Council.*—Subject to the authority and direction of the Secretary of Defense the Council shall perform the duties listed below in support of strategic and logistic plans and in consonance with guidance in those fields provided by the Joint Chiefs of Staff and in support of other Department of Defense program. The Council will also perform such other duties as may be directed by the Secretary of Defense.

Specifically the Council is charged with providing within its jurisdiction, such broad basic policies, plans and programs as will provide guidance to other Department of Defense agencies and will enable the Military Departments to prepare and execute detailed policies, plans and programs. The Council shall not engage in administration or operations for which an agency already exists. The Council shall

- (1) Develop basic medical and health policies for the Department of Defense in collaboration with appropriate agencies and departments.

(2) Review medical and health policies, plans and programs of each of the Military Departments with respect to

- a. Conformity with approved policy
- b. Adequacy when unilaterally developed
- c. Consistency between the policies of the different Departments

As a result of these reviews, initiate appropriate action

(3) Review the medical and health policies, plans and programs which other defense agencies (JCS, MB, R&DB, PPB, CCI, B) are responsible for, advising the Secretary of Defense of their views and of their opinion on specific medical and health aspects of any given policy, plan or program and recommending appropriate action. Assist in developing as requested, the medical and health aspects of such broad policies, plans and programs.

(4) In collaboration with the Military Departments concerned develop, coordinate and establish when appropriate and necessary in support of approved policy, medical and health plans providing for

- a. Uniform programs within two or more separate Departments.
- b. Joint programs by two or more Departments.
- c. Cross-servicing and joint utilization of facilities.

(5) Develop the maximum degree of continuing cooperation and mutual understanding between members of the civilian medical and allied professions and the Armed Services.

(6) Advise the Assistant Secretary of Defense (Comptroller) in the review of budget estimates of the Military Departments for medical and health activities.

(7) Recommend to the Assistant Secretary of Defense (Legislative and Legal Affairs) regarding proposals for new legislation or changes in existing legislation affecting medical and health services.

(8) When appropriate and necessary, initiate and coordinate the development and use of standard medical nomenclature, reports, records, technical procedures and methods and technical regulations within the Military Departments. Collaborate with agencies of the Department of Defense in similar efforts toward uniformity in such related fields as material specifications, budgeting and cost accounting.

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Editor's Note: Explanation of symbols used in paragraph (3): JCS, Joint Chiefs of Staff; MB, Munition Board; R&DB, Research and Development Board; PPB, Personnel Policy Board; CCI, Civilian Components Policy Board.



(9) Represent the Secretary of Defense in the coordination of matters of mutual interest and importance to the Department of Defense and other governmental and non-governmental organizations in the medical and health field

(10) Arrange for any member of the Council to place an item on the Council agenda.

*B. Duties of the Chairman.*—The Chairman of the Council shall be the principal advisor and assistant to the Secretary of Defense on medical and health matters with which the Secretary of Defense may be concerned and will be guided in such advice by the views of the Council.

The Chairman of the Council shall, with the advice and assistance of the staff prepare policies, plans and programs for presentation to the Council.

The Chairman, in consonance with views of the Council, shall represent or arrange for representation of the Department of Defense before and with other governmental Departments and agencies on all matters for which the Council has responsibility under the provisions of this Directive.

In addition to participating as a member of the Council, in the performance of the duties assigned in Section III the Chairman shall, subject to the authority and direction of the Secretary of Defense perform the following duties

1. Serve as the presiding officer of the Council.
2. Provide agenda for meetings of the Council and assist the Council in the prosecution of its business as promptly as practicable
3. Inform the Secretary of Defense of those issues upon which agreement among the members of the Council has not been reached.

#### IV ADMINISTRATION

The Secretary of Defense will provide the Chairman with such personnel, facilities, and other administrative services as he from time to time determines are required by the Chairman for the performance of the Council's functions. Military personnel in approximately equal numbers shall be provided by each of the three Military Departments, in accordance with the needs of the Chairman as approved by the Secretary of Defense. Such military personnel shall be acceptable to, and during their tours of duty with the Council, responsible to, the Chairman of the Council rather than to their own department with respect to performance of duty and efficiency ratings.

The Chairman subject to the approval of the Secretary of Defense shall provide for the internal organization and staffing of the Council and shall establish its rules of procedure. The staff of the Council shall be responsible to and shall function under the direction, supervision and control of the Chairman.

Committees operating within the jurisdiction of the Council will function under the authority, direction and control of the Chairman of the Council.

The Council shall meet at the call of its Chairman, or at such times as it may fix and the presence of five members or their duly designated alternates, including one representative from each Military Department, shall constitute a quorum.

#### V RELATIONSHIPS

The Chairman, the Council and the staff of the Council are authorized and expected to communicate directly and expeditiously with other agencies of the Department of Defense and the Military Departments and appropriate sub-divisions thereof concerning any matter within its jurisdiction and in which there exists a mutual interest or responsibility.

The Council shall coordinate its efforts with all agencies within and outside the Department of Defense which have a mutual interest or responsibility with respect to any of its programs, and will determine what formal concurrences, if any, are required.

G C MARSHALL

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### THE SECRETARY OF DEFENSE

WASHINGTON

2 January 1951

Memorandum for The Secretaries of Military Departments  
The Assistant Secretaries of Defense  
The Joint Chiefs of Staff  
The Chairmen, Boards, Councils and Committees,  
OSD  
The Directors of Offices, OSD

Dr Richard L. Meiling is appointed Chairman of the Armed Forces Medical Policy Council effective 2 January 1951

G C MARSHALL





# About the Army Medical Service

## Operation NavMed

FRED J. FIELDING, *Lieutenant Colonel MC USA*

ON 20 SEPTEMBER 1950 The Secretary of Defense directed that the United States Navy recall sufficient numbers of medical officers in their Volunteer Reserve who received their medical education at Government expense to meet the immediate requirements of the United States Army and United States Air Force. At that time the Air Force was obtaining sufficient volunteers so that they did not require these officers. On 30 September, the Army Chief of Staff requested the Chief Naval Operations, to furnish 570 medical officers for duty with the Army on a temporary basis. In order properly to evaluate and process these doctors it was decided to have them assemble at Brooke Army Medical Center San Antonio Tex. The Bureau of Personnel Department of the Navy issued orders on 2 October for the first group to report on 16 October with subsequent groups to report on 17, 18, 21 and 23 October and 1 November.

The commanding general at Brooke Army Medical Center was requested to be prepared to receive these officers, process them for active duty and to give them an intensive 3-day orientation course concerning basic Army matters during the 5- or 6-day period in which they would be temporarily assigned to his installation. The period from 2 to 14 October was used to prepare for this project.

The administrative procedures connected with these Navy officers presented many problems. From a series of conferences with representatives of C-1 the Adjutant General the Surgeon General and the Bureau of Personnel Department of the Navy administrative instructions covering 20 points were resolved. These were published in Department of Army Adjutant General Letter, subject "Administration of Naval Medical Officers Procured from the United States Naval Reserve for Assignment to Duty With the Army" dated 16 October 1950 file AGPA-1. The Bureau of Personnel Department of the Navy furnished the Personnel Division of the Surgeon Gen

eral's Office with copies of orders giving the names, file numbers, and addresses of the officers who were ordered to Brooke Army Medical Center for processing. The Navy orders indicated that officers would be temporarily assigned to Brooke, pending further orders. From this information, working rosters, status cards, and personnel files were prepared. Letters of welcome from the Army Surgeon General were also prepared and mailed to Brooke Army Medical Center to the individual medical officers. Identical rosters of the Navy physicians were prepared for the officers concerned in the Personnel Division, and for the Navy liaison representative who went to Brooke Army Medical Center to process the Navy medical officers as they arrived.

The final scheduling of reporting dates of the Navy officers was as follows: On 16 October 20 on 17 October 20 on 18 October 20 on 21 October 102 on 23 October 130 on 26 October 1 on 27 October 2 on 28 October 3 on 30 October 3 on 31 October 4 on 1 November 240 and on 6 November 2 a total of 570.

On 14 October the Assistant Staff Corps Liaison Officer, Bureau of Personnel, Department of the Navy arrived at Brooke Army Medical Center for initial coordination with the Army finance officer for payments to the Navy physicians while at the Medical Field Service School, as well as final arrangements connected with the establishment of a temporary ship's store from the Navy Air Station, Corpus Christi, Tex., which was stocked with navy uniforms to be available for the convenience of the incoming navy physicians. The Chief Administrative Area Section, Assignment Branch, Adjutant General's Office, Department of the Army also arrived on 14 October for initial coordination on the preparation of morning reports and other records as the Navy medical officers arrived.

On 15 October the Head, Surgery Branch, Professional Division, Bureau of Medicine and Surgery and the Staff Corps Liaison Officer, Bureau of Personnel, Department of the Navy as well as the Special Assistant to Chief, Personnel Division, Surgeon General's Office, Department of the Army arrived at Brooke. These officers represented the liaison group from Washington, D. C. who would assist in the processing of the Navy medical officers, who began to arrive on 16 October. Later the Head, Distributions Control Section, Officer Personnel Division, Bureau of Personnel, Department of the Navy replaced the Staff Corps Liaison Officer, Bureau of Personnel, Department of the Navy.

The Navy physicians, on their arrival at Brooke Army Medical Center completed a questionnaire from which their professional classification was determined. They were next interviewed to clarify any questions concerning items of doubt which may have been entered on

the classification questionnaire. They were also questioned as to their choice of location of geographic assignment and also as to any specific personal reasons, such as family illness, which might indicate initial assignment to a location near their home. During this initial interview, the officers were advised of the availability of the representatives from the Bureau of Personnel and the Bureau of Medicine and Surgery Department of the Navy to assist in the solution of any problems connected with their current Navy orders or other purely Navy problems. They were advised of their schedule while at Brooke Army Medical Center and of their departure date of 5 to 6 days later. They were also advised concerning the professional records which they should maintain while on active duty in order to obtain the proper specialty board evaluation of their military service. They were given their professional classification number with an explanation of its meaning. Finally, they were told that on a second interview 24 hours later they would be informed of the location of their new Army assignment, with their actual orders forthcoming some 72 hours later.

On completion of the initial interview if this had been completed prior to 10 a. m., the officers would proceed with the first day's processing. Officers who arrived after that time were interviewed, then sent to the uniform store on the first day and their major processing was started on the following day. The first day's processing consisted of general administrative actions. Pay vouchers, income tax forms, allotments, personnel records, insurance applications, et cetera, were prepared and completed. Immunizations, blood typing identification tags, identification cards, etc. were initiated. Class lectures were given by Navy liaison representatives on Navy matters as well as lectures by Army representatives on Army matters of immediate interest to these Navy doctors embarking on their duty with the Army.

Following the first day of processing the doctors were given 3 days of intensive Army orientation, which covered Army Medical Service in the field, and in fixed hospitals radiologic defense military correspondence, law and courtesies medical supply procedures military preventive medicine and neuropsychiatry and legal and personal affairs. This orientation course was conducted by the instructors of the Army Medical Field Service School at Brooke Army Medical Center and was so designed that the naval officers could start on any one of the 3 days since the course was continuous and cyclic. In addition on 5 November a special class was given to 100 of the doctors who were given overseas assignments. This included talks by the Director of Combined Arms Training at the School, who was a combat line leader in both the European and Far East Theaters during World War II and a talk by a wounded Medical Service Corps officer, formerly assigned with the 24th Division in Korea. Additional reorien-

tation was given this final group on travel problems, pay allotment in urance and execution of powers of attorney and wills.

The majority of the Navy officers received their orders for their new assignments 1 to 2 days before the end of their orientation period. The orders were timed to permit travel by automobile to their new station, as well as authorizing 3 days delay chargeable as leave, if the officer desired to take advantage of this provision. All officers received a cash payment before their departure, which included \$150 of their uniform allowance and advance of 1 month's base pay and travel pay for all travel they had completed on their arrival at Brooke Army Medical Center. For most of them the cash payment was exceedingly welcome and in some cases was absolutely essential to the officer concerned.

In processing for permanent assignment, daily telephone calls were made by the Army liaison representative to the Chief Career Management Branch, Personnel Division, Surgeon General's Office. On this call information was given on the individual Navy medical officers professional classification and choice of assignment area with any other special remarks. Information was received on this same phone call as to the permanent station assignment of the officer concerned, who had been previously reported. This procedure was followed until the entire group had been reported and assignments received back. In the Office of the Surgeon General when the professional classification had been reported stations were selected according to vacancies within the geographic area of choice as near as possible. Home address was taken into consideration in order to place an officer as near home as possible as well as to avoid long moves in the case of families and to prevent unnecessary expense to the Government. After selection of permanent stations request for issuance of orders was made to the Adjutant General in the normal manner for telegraphic orders. The orders so telegraphed to the officers at Brooke Army Medical Center were reproduced locally so that each officer would have sufficient copies and were then given to him there.

In several instances, the fact that an officer was engaged in research activities was brought out from the professional classification questionnaire during the initial interview. Selected officers from this group prepared a special research questionnaire with further selected officers then being sent for special interview with a representative of the Research and Development Division of the Surgeon General's office. Later after departure from the liaison group of this special representative, officers selected for research interviews were sent to the Surgical Research Unit at Brooke Army Medical Center. About 10 officers from the entire group were given assignments in which they would continue in research activities. The special research ques-

tionnaires were all retained and were returned for file in the Research and Development Division of the Surgeon General's office.

Copies of all professional questionnaires were made by the members of the Navy liaison group for return and filing in the Bureau of Medicine and Surgery of the Department of the Navy. Because these 570 Navy medical officers were formerly in the V-12 program and were without prior service they represent a cross section of the type of officers who may be expected to enter the Armed Forces under the provisions of Public Law 779 81st Congress, in the Priority One group. A large number of them were in residency training. It was necessary to issue orders to about 35 percent more than the number required in order to permit deferment of those whose call to active duty would have created undue hardship in individual hospital. (Statistical studies show that of these Priority One officers, 87 percent are in residency training.) Data as to their professional classification is shown in table 1.

TABLE 1—Distribution of War I Reserve officers by professional classification

Classification	Percent	Classification	Percent
General practice	28.3	Otolaryngology	1.2
Internal medicine	18.3	Radiology	1.2
General surgery	16.5	Pulmonary disease	0
Pediatrics	8.0	Neurology	0
Obstetrics and gynecology	6.9	Neurosurgery	5
Psychiatry	4.0	Dermatology	3
Anesthesiology	2.1	Clinical laboratory	3
Orthopedic surgery	2.1	Industrial medicine	2
Tissue pathology	1.8	Radiological defense	2
Ophthalmology	1.6	Cardiology	2
Miscellaneous (research)	1.5		
Urology	1.2	Total	100.0

Assignments of these officers were made to Army stations throughout the continental United States as well as to the Far East and European Commands. Except for the overseas assignments, where some of the officers were not volunteers 90 to 95 percent of the geographic requests for station assignments were granted. The officer's home address was considered and assignments were made as close as possible to their homes. Professional classification of the officer and use of his ability took precedence over choice of assignment area when assignments were made. When it was necessary to take nonvolunteers for overseas assignments, single officers and married officers without children were selected. The assignment distribution is shown in table 2.



TABLE 2.—*Distribution of Naval Reserve Officers by area of assignment*

Area	Number	Area	Number
Far East Command	98	Third Army area	50
European Command	17	Fourth Army area	40
T/O Unit (evacuation and mobile surgical hospitals)	15	Fifth Army area	67
Surgeon General's Command (general hospitals, et cetera)	74	Sixth Army area	53
First Army area	41	Military District of Washington	11
Second Army area	63	Miscellaneous	9
		Total	370

Aside from the officers selected for overseas assignments, only 43 of the remaining 427 officers received assignments which were not directly under the commander of a hospital. It can be said that this project of working unification was a complete success, with the Army receiving a fine group of physicians, well qualified professionally whose morale was excellent when they departed for their permanent duty station.



## BOOKS RECEIVED

- The Neurologic Examination, Incorporating the Fundamentals of Neuroanatomy and Neurophysiology** by *Richard A. DeJong* M.D. Professor of Neurology and Chairman of the Department of Neurology University of Michigan Medical School. 1,079 pages. 26 Illustrations. Paul B Hoeber Inc., New York, N.Y. publisher 1930. Price \$15.
- Therapeutics in Internal Medicine** edited by *Frank A. Koser* M.D., M.R., F.A.C.P. Associate in Medicine, Northwestern University Medical School, Chicago. Attending Physician, Evanston Hospital, Ill. 715 pages illustrated. Thomas Nelson & Sons, New York, N.Y. publisher 1930. Price \$1.00.
- Basic Principles of Clinical Electrocardiography** by *William H. Hecht* M.D. Associate Professor of Medicine University of Utah School of Medicine Salt Lake City Utah. 85 pages illustrated. Charles C Thomas, Publisher Springfield, Ill., 1930. Price \$.50.
- The 1930 Year Book of Pediatrics**, edited by *Henry G. Panicker* M.D. Professor and Head, Department of Pediatrics, College of Medicine University of Illinois, with the collaboration of *J. H. B. Richmond* M.D., Associate Professor, Department of Pediatrics, College of Medicine, University of Illinois. *Isaac A. Abbott* M.D. editor in chief. 304 pages illustrated. The Year Book Publishers, Inc. Chicago Ill., publisher 1930. Price \$3.
- New Concepts of Inflammation**, by *Ulysses Merz* M.A., M.D. Associate Professor of Experimental Pathology Head of Experimental Pathology Agnes Barr Chase Foundation for Cancer Research, Temple University School of Medicine Formerly Assistant Professor of Pathology Duke University School of Medicine Formerly Assistant Professor of Pathology Harvard University Medical School Presented before the Midwest Seminars of Dental Medicine Maxwellton Brues Bailey Harbor Wis., September 19-23, 1931. 145 pages illustrated. Charles C Thomas Publisher Springfield, Ill., 1930. Price \$2.50.
- Bacterial Polymers, Their Chemical and Immunological Aspects**, by *M. L. Berper* Formerly Organic Chemist to the Bureau of Laboratories, New York, N.Y. 66 pages illustrated. Charles C Thomas, Publisher Springfield, Ill., 1930. Price \$6.
- Regional Orthopedic Surgery** by *Paul C. Colver* M.D. Professor of Orthopedic Surgery University of Pennsylvania Medical School. 700 pages. 474 illustrations. W.B. Saunders Co., Philadelphia, Pa., publisher 1930. Price \$11.50.
- Child Psychiatry in the Community** Primer for Teachers, Nurses, and Others Who Care for Children, by *Harold A. Greenberg* M.D. Senior Staff Psychiatrist, Institute for Juvenile Research, Chicago. Assistant Professor of Criminology College of Medicine, University of Illinois, Chicago. In collaboration with *J. H. H. Putnam* Ph.D. Chief Psychologist, Downey Veterans Administration Hospital, Downey Ill. Formerly Assistant Professor of Psychiatry and Psychology, Illinois Neuropsychiatric Institute. College of Medicine University of Illinois, Chicago. Formerly Senior Staff Psychologist, Institute for Juvenile Research, Chicago. *H. H. Putnam* Ph.D. M.A., B.A., formerly Psychiatric Neurologist, Institute for Juvenile Neuropsychiatric Institute College of Medicine University of Illinois, Chicago. *Marjorie M. Brown* B.A., M.A. Instructor School of Social Service Administration, University of Chicago. 296 pages illustrated. G. L. Putnam Sons, New York, N.Y. publisher 1930. Price \$2.50.
- Advances in Internal Medicine** Vol. IV edited by *William Dorr* M.D. Long Island College of Medicine Brooklyn, N.Y. and *Frank M. Theiss* M.D. The Mount Sinai Hospital, New York, N.Y. with four associated editors. 348 pages illustrated. The Year Book Publishers Inc., Chicago, Ill., publishers 1930. Price \$10.
- Electrophoresis in Physiology** by *Leah A. Lewis* Ph.D., Research Fellow, Cleveland Clinic (Ill.) Cleveland, Ohio. 66 pages illustrated. Charles C Thomas Publisher Springfield, Ill., 1930. Price \$1.50.

**Orthopaedic Surgery** by Walter Mercer M. B., Ch. B., F. R. C. S. (Edin.) F. R. S. (Edin.) Professor of Orthopaedic Surgery, University of Edinburgh; Director of Orthopaedic Services, the South-Eastern Regional Hospital Board, Scotland; Formerly Surgeon, Royal Infirmary, Edinburgh; Lecturer in Clinical Surgery, University of Edinburgh; Surgeon in Surgical Tuberculosis, the South-Eastern Counties of Scotland Joint Sanatorium, East Fortune; Surgeon, Ministry of Pensions Hospital, Edinburgh; Consultant Surgeon, Clinic for Limbless Personnel, Edinburgh; Consultant Surgeon in Orthopaedics, Emergency Medical Service, Department of Health for Scotland; Consultant Surgeon, Balmain Hospital for the Sick and Hurt, Edinburgh; Surgeon to Pollock and Galsworthy Cottage Hospital; Surgeon-in-Charge, Tynecliffe Orthopaedic Clinic; Specialist in Operative Surgery, Edinburgh W. Hospital; Examiner in Medical Electricity, Chartered Society of Physiotherapy; Consultant Surgeon, Tynecliffe Orthopaedic Clinic; Ministry of Pensions; President, Scottish Local Board Chartered Society of Physiotherapy; with foreword by Sir John Fraser, Bart. K. C. V. O. M. C. F. R. S. Ed. F. R. C. S. Ed. M. D. B. M., F. R. A. C. S. F. A. C. S. British Professor of Clinical Surgery in the University of Edinburgh. 4th edition. 116 pages. Illustrated. The Williams & Wilkins, Baltimore, Md., publisher. \$10.

**When Minds Go Wrong, A Simple Story of The Mentally Ill—Past, Present, and Future** by Jack Maurice Grimes M. I. Twenty years' psychiatric; Four years' staff member of the Council on Medical Education and Hospitals of the American Medical Association. Author of "Last Rational Care of Mental Patient in the United States." 237 pages. Illustrations by E. Alexander Whit. Published and distributed by the publisher, 1209 North Dearborn Ave., Chicago 18, Ill., 1940. Price \$3.

**The Clinical Use of Testosterone**, by Henry H. Turner M. D., F. A. C. P. Clinical Professor of Medicine, School of Medicine, University of Oklahoma, Oklahoma City. 7th ed. 66 pages. Illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1940. Price \$2.50.

**Essentials of Urology** by J. C. Ashworth Davis M. A., M. D., B. Ch. (Camb.) F. R. C. S. (Eng. and Edin.) Urological Surgeon, The Brompton Hospital, London; Visiting Urologist, King's and District General Hospital and the Lord Mayor Treloar Hospital, Aston, Birmingham; Consulting Urologist, Royal Westminster Hospital, London; Late Wing-Commander, Surgical Division, Royal Air Force Medical Services; Secretary to Council, Royal Society of Medicine. 734 pages. Illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1940. Price \$10.

**The 1940 Year Book of Obstetrics and Gynecology** (August 1940-July 1940) edited by J. F. Greenhill B. S. M. D. F. Professor of Gynecology and Obstetrics, School of Medicine, and Chief, Obstetrics and Gynecologist, Michael Reese Hospital, Chicago; Lyman Hospital; author of "Obstetrics and Gynecology in General Practice" and author of "The Intra-Uterine Principles and Practice of Obstetrics." 57 pages. Illustrated. The Year Book Publishers, Inc., Chicago, Ill., publisher, 1940. Price \$2.

**Problems in Cerebellar Physiology** by G. Moruzzi, M. D., Professor and Head of the Department of Physiology, University of Pisa, Pisa, Italy. Annual Research Professor of Neurology, Northwestern University Medical School, Chicago, Ill. 11 pages. Illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1940. Price \$2.50.

**Skull Fractures and Brain Injuries**, by Henry R. Meek, M. D., Consulting Surgeon, St. Luke Hospital, Chicago; Assistant Professor Emeritus of Surgery, Northwestern University Medical School, Chicago. 494 pages. Illustrated. The Williams & Wilkins Co., Baltimore, Md., publisher. 1940. Price \$12.50.

**Vital Anatomy: Head and Neck**, by Sydney M. Friedman, M. D., Ph. D. Professor of Anatomy, University of British Columbia, Vancouver, Canada; Formerly Associate Professor of Anatomy, McGill University, Montreal, Canada. 217 pages. Illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1940. Price \$6.00.

**Methods of Medical Research, Volume 2**, Governing Board, Henry H. Pope, Chairman; Sir Colin M. MacLeod, and F. Ashworth Davis, M. D., David C. Thomson, Ralph W. Gerard, Editors; and S. E. Lurie, Editor. Secretary of Micro-organisms, J. H. Gold, Editor. Area of Neurochemistry, W. H. R. Murray, Editor. Selected Psychometric Measurements, Methods, Chas. H. Lee, Editor. Methods of Study of Peptide Structure, 3 pages. The Year Book Publishers, Inc., Chicago, Ill., publisher, 1940. Price \$1.

## BOOK REVIEWS

**A Textbook of X-ray Diagnosis**, by British authors. Volume IV of four volumes. Edited by *S. Cochrane Shanks* M.D. F.R.C.P., F.F.R., Director X-ray Diagnostic Department, University College Hospital, London and *Peter Herley* M.D. F.R.C.P. F.F.R., F.M.R.E., Director X-ray Department Westminster Hospital Radiologist, Royal Chest Hospital, London. 2d edition, 502 pages 553 illustrations. W. B. Saunders Co. Philadelphia, Pa., publishers, 1930. Price \$15.

This is an outstanding work on radiology of the bones and joints. It begins with descriptions of the normal as viewed in the standard radiographic position. Ossification times are given, and both the common and rare osseomoids are described, followed by a discussion of the general pathology of bone with consideration of the types of bone structure the mechanisms of bone deposition and absorption the effects of inflammatory conditions and tumors on bone and the general factors affecting calcium metabolism. There are excellent chapters on traumatic lesions, inflammatory diseases, the osteochondritides, constitutional diseases, and bone tumors. The material is well organized and written in a clear concise manner. The reproductions are positive but are of unusually good quality.—*Col D. B. Kellogg MC U S A.*

**Radiation Therapy in the Management of Cancer of the Uterine Cervix**, by *Simcon T. Cantil* M.D. Director Tumor Institute of the Swedish Hospital, Seattle Wash. Publication No. 72, The American Lecture Series. 106 pages illustrated. Charles C. Thomas, Publisher Springfield, Ill., 1930. Price \$5.

This excellent monograph on the radiations in cancer of the cervix has been compiled from the author's extensive experience and from the voluminous world literature on the subject. The author has concentrated into a small and compact volume all of the important thoughts, experiences, and conclusions of experts in the field of radiation therapy. In 11 chapters and 2 appendices he discusses clinical considerations, postoperative complications, staging biopsy radiation therapy, effects of the cervical stump, cancer of the cervix in pregnancy and the place of surgery in the management of cancer of the cervix. All are well written and of absorbing interest. In the chapter on radiation therapy he discusses in detail the Stockholm, Portland Manchester techniques of radiation therapy and emphasizes the importance of the art of medical practice by reference to and quotation from the masters of the art and expert testimony. A comprehensive tabulation of the results of therapy as reported by North American and European clinics and hospitals has been included in the chapter. Appendix A contains extract from the League of Nations 1937 clinical staging of cervical cancer. Appendix B outlines briefly the principles of dosimetry in intracavitary radium therapy. There is an excellent and complete bibliography of world literature on the subject of uterine cancer. The index is simple and complete.—*Col E. J. Loomis MC U S A.*

**Immortal Magyar Semmelweis, Conqueror of Childbed Fever** by Frank O. Rhyler M. D. 211 pages. Illustrated. Henry Schuman, New York, N. Y. published 1939. Price \$2.50.

This is an unusually well-written biography which portrays the tragic professional life of Ignaz Philipp Semmelweis. The book gives in popular language a vivid description of the times in which he lived. It demonstrates how medical progress and history can be altered by self-centered persons and I recommend it to those interested in medical history and particularly to those interested in the battle against childbed fever.—Lt. Col. H. L. Rice, MC U. S. A.

**Enzymes, Growth and Cancer** by V. R. Potter Ph. D. Professor of Oncology University of Wisconsin Medical School, Madison, Wis. Publication No. 75, America. Lecture Series. 64 pages. Charles C Thomas, Publisher Springfield, Ill., 1940. Price \$1.50.

This book provides an interesting introduction to investigation into enzyme research. It is relatively non-technical and presents a field in which some investigative work is being done. It is written to acquaint medical practitioners with one means of attack on cancer, the basis for this method of attack, and some of its accomplishments to date.—Col. W. N. George MC U. S. A.

**The Closed Treatment of Common Fractures**, by John Chernley B. Sc., M. D. F. R. C. S., Assistant Honorary Orthopaedic Surgeon, Manchester Royal Infirmary. Visiting Orthopaedic Surgeon, The Park Hospital, Darbyshire. Lecturer in Orthopaedics Manchester City Hospital. Late Hunterian Professor Royal College of Surgeons. 194 pages, 133 illustrations. The Williams & Wilkins Co. Baltimore, Md. publishers, 1940. Price \$5.

The author is one of the outstanding younger British orthopaedists and traumatologists. He has written this book for the "resident casualty surgeon," stating that he believes that the details of manipulation and treatment of fractures are inadequately taught. He also believes that the operative treatment of fractures is overemphasized—that many open reductions are needlessly performed. The basic mechanics of fracture treatment are lucidly discussed and illustrated. There is a valuable study of the various types of modern plaster of Paris technique. Anyone who may ever be called upon to apply plaster should read this and re-examine his own technique in its light. There are well-written chapters on the common fractures of each of the long bones. Each discussion is accompanied by excellent diagrams of the mechanical principles and by illustrations—roentgenograms. A detailed discussion of the rationale and technique of the use of the Thomas splint in fractures of the long bones of the lower extremity is given. This is especially useful in the military services in instances in which patients must be transported and more elaborate equipment is not available. Because this method is not taught in the United States the author's description is especially valuable. The author does not invariably discuss the closed treatment of fractures, he includes indications for open reduction, and as to the types of fixation he prefers.—Lt. Col. A. B. Dickson, MC U. S. A.

**The Prostate Gland**, by Herbert R. Krusen M. D. Associate Clinical Professor Department of Urology New York University Bellevue Medical Center. 194 pages. Random House New York, N. Y., publisher 1939. Price \$2.50.

The need for accurate authoritative information on the prostate gland, in particular and the male genitourinary system, in general, has existed for many years. The profusion of erroneous and conflicting in the popular magazines and

newspapers urging the purchase of quack remedies and devices for the relief of the symptoms of "prostate trouble" manifests the long-existing need for just such a book as Dr Kenyon has written. As evidenced by the innumerable books on sex life "diseases of men," the physiology of reproduction and allied subjects, the interest in the topic is tremendous. Because millions of dollars are sucked from the public annually by self-styled specialists in diseases of men, sexologists, and other charlatans, the economic consideration is equally impressive.

The increase in life expectancy in the United States since 1900 has been spectacular and it has been predicted that in about 30 years, 21 million people in this country will have attained the age of 65 years. Thus gerontology has assumed great importance. Inasmuch as the incidence of prostatic enlargement—both benign and malignant—is high in men over 60 years old, the problem of relief of the symptoms of urinary obstruction is one of increasing moment.

The term "prostatism" is used to include all types of urinary obstruction which occur at the bladder neck. In lucid, nontechnical language the author has succeeded admirably in explaining these conditions so that the average reader will have no difficulty in understanding them. The book, which is surprisingly complete, may easily be read in a single evening. The extremely readable text, most attractively printed and illustrated by four simple line drawings and a single graph, is not interrupted by distracting references to footnotes, appendices, or technical articles. In nine brief chapters, the author has developed his subject in such manner that the interested, intelligent layman will have no difficulty understanding the subject. Functional disorders, infectious diseases, and numerous other afflictions of the prostate are discussed. The cause of prostatism and its treatment by nonsurgical methods are fully considered and explained before the various methods of surgical correction are described. Although the author makes no false claim as to the safety of prostatic operation, his revealing graph and text relative to the impressive decline in mortality following such operation since 1920 will go far to allay the fears of many potential candidates for one of the several types of operative procedure.

This book, written by a urologist of wide experience, may be recommended not only to the patient but to his family as well. Thus the reasons for the careful preoperative preparation and study the choice of operation and the functional results to be expected may be more readily comprehended and the effort of the urologist more fully appreciated. The author has presented these problems in such a way as to insure the understanding and confidence of the interested, intelligent layman, even if the scientific and medical knowledge of the reader is limited.—*Capt B Johnson, MC USN*

**Methods of Tissue Culture** by *Romo d C Parker* Ph. D. Research Associate Connaught Medical Research Laboratories and Associate Professor of Experimental Cytology School of Hygiene University of Toronto with a chapter by *Joseph F M Ryan* Ph. D. Research Associate Connaught Medical Research Laboratories, University of Toronto. 2d edition. 234 pages + 113 illustrations. Paul R Hoeber Inc., New York, N. Y., publishers 1950. Price \$7.00.

This volume describes and illustrates various phases of tissue culture types of apparatus and technical layout. Photomicrographs showing the results of the technique used are included. The introduction dealing with the historical background of tissue culture makes fascinating reading. Each phase of tissue culture is discussed in detail. Equipment, media, and application of method

receive special attention which is of value to the novice. It profits from the presence of the author one may find many errors and omissions. The chapter on fluoroscopy and microangiography is especially informative and clearly written. There is extensive bibliography at the end of the book.

—*Commentary* T. W. B. Smith, MC U.S.A.

**The 1950 Year Book of Radiology (June 1949-June 1, 1950)** Its *Historic Diagnosis* edited by Fred Jensen Hodge, M.D., Professor and Chairman, Department of Roentgenology, University of Michigan, and Job Floyd Holt, M.D., Assistant Professor, Department of Roentgenology, University of Michigan. *Radiation Therapy* edited by Leonard Langer, M.D., Associate Professor, Department of Roentgenology, University of Michigan, and Robert H. Marshall, M.D., Assistant Professor, Department of Roentgenology, University of Michigan. 440 pages illustrated. The Year Book Publishers, Inc. (Chicago, Ill., publisher 1950). Price \$9.75.

This book presents abstracts of the published radiologic studies of interest from foreign and domestic journals for the period from June 1949 to June 1950. The editors have presented a summation of the year's output in concise and understandable form, including numerous illustrations from the original articles. The year has yielded noteworthy progress in roentgen diagnosis and radiation therapy. This Year Book of Radiology is an excellent review of the radiologic publications for the year and should be studied by all physicians who are interested in roentgen diagnosis and radiation therapy.

—*Commentary* T. W. B. Smith, MC U.S.A.

**Acute Head Injury** by Joseph P. Frazee, M.D., Assistant Professor of Surgery, Director of Neurological Surgery, University of Cincinnati College of Medicine (Cincinnati, Ohio). Publication No. 68, American Lecture Series. 116 pages illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$5.50.

This recent contribution to the American Lecture Series is a timely, concise and highly instructive monograph. Dr. Frazee has divided his material "arbitrarily" and is totally lost for chapters dealing with scalp injuries, skull fractures, meningeal hemorrhage and cerebral trauma. The subject of gunshot wound was purposefully omitted. The author exhibits uncanny ability to answer the question which came to mind as one read, but only a short pace from the point where the question arises. Traveling and overseas aid made in the study of the circulatory changes secondary to intracranial lesions. Excellent representation of case histories with photographs of specimens are included. A selective bibliography enhances the use of this volume. This book is recommended for quick reference to the medical officer who, faced with head injury problems, find himself without the benefit of neurologic consultant.—*Commentary* R. C. Spry, MC U.S.A.

**Bronchoesophagology** by Charles J. Lowe, M.D., Sc.D., LL.D., F.A.C.S., Honorary Professor of Bronchoesophagology and Laryngeal Surgery, Temple University Philadelphia and Chief, L. Jackson M.D., M.Sc., F.R.C.S. Professor of Bronchoesophagology and Laryngeal Surgery, Temple University Philadelphia. 200 pages illustrated. W. B. Saunders Co. Philadelphia, Pa., publisher 1950. Price \$12.50.

This is a completely new edition of the classic *Bronchoesophagology and Laryngology* which was published in three editions last along 1922 by the same author. This new edition is improved by more material and beautifully illustrated chapter on the anatomy of the tracheobronchial tree and

the lungs, a greater use of natural appearing color illustrations and a more easily readable text. Every bronchoscopist and esophagoscopist whether he be primarily a laryngologist thoracic surgeon, or medical chest specialist, will want to read this book and have it available for a ready reference.

—*Conrad T. Ry MC U S A*

**Pediatric X ray Diagnosis, A Textbook for Student and Practitioners of Pediatrics, Surgery and Radiology** by *John Coffey A. B. M. D.* Professor of Clinical Pediatrics College of Physicians and Surgeons, Columbia University Attending Pediatrician and Roentgenologist Babies Hospital and Vanderbilt Clinic, New York City Consulting Pediatrician, Grasslands Hospital Westchester County N. Y. and New Rochelle Hospital, New Rochelle N. Y. Consulting Roentgenologist Orange Memorial Hospital, Orange, N. J. Consultant in Pediatric Roentgenology The New York Hospital, New York City. 2d edition. 862 pages illustrated. The Year Book Publishers, Inc. Chicago Ill. publisher 10.00 Price \$22.50

This is the second edition of the authoritative text which was first published in 1915. Like the first edition, it is easy to read. The clear print the beautiful reproduction of roentgenograms, the excellent line drawing and the well written text make it a reference book which has not been equaled in the difficult field of x ray diagnosis in children. Although fewer than 40 pages are without one or more illustrations, this book contains more than an x ray atlas. It is divided, like the first edition, into sections which cover the development of the normal, the variants from normal and the diseases of all the systems of the body. The author has expanded the sections on prenatal depression of the skull pulmonary arteriovenous fistula primary reaction to chemical poisons pulmonary histoplasmosis necrotizing peritonitis, cerebral defects of tubular bones, infantile cortical hyperostosis and hyperostosis infantilis. And he added much new material.—*Col E. M. DeFon g MC U S A*

**Renal Diseases**, by *E. T. Bell M. D.* Professor of Pathology in the University of Minnesota Minneapolis Minn. 2d Edition. 448 pages 125 illustrations and 4 color plates. Lea & Febiger Philadelphia Pa. publishers. 1930 Price \$8.

Dr. Bell has revised the first edition of this excellent reference book, incorporating therein data from about 18,000 additional autopsies and opinion from recent literature concerning the renal disease entities. He has included his own comment and conclusion from studies among of the subject which have been discussed in the literature and gives the lines of controversial questions. This compilation of clinical and pathological aspects of most important disease group is a valuable reference for pathologist, clinician, and teachers alike. The illustrations are commendable for their excellent detail the clarity with which they illustrate the subject matter and the proportion to the related text. An excellent bibliography is given in connection with each subject.

—*Col V. H. Cronin MC U S A. (ret)*

**The Diagnosis and Treatment of Endocrine Disorders in Childhood and Adolescence** by *Lawson Wilk M. D.* Associate Professor of Pediatrics, The Johns Hopkins Hospital, Baltimore Md. 408 pages 411 illustrations 6 in full color Charles C. Thomas, Publisher Springfield Ill. 10.00 Price \$12.

This is a new textbook available to all pediatricians who have followed the author's work in the literature and at various medical meetings. Dr. Wilkins, a recognized authority in endocrine and metabolic research who has been engaged in the practice of clinical pediatrics presents his material from



the standpoint of the diagnostician faced with the problem of deciding whether particular symptom complex is caused by a congenital anomaly, constitutional variation in pattern of development, or an endocrine disorder which may be helped by treatment. Tables, diagrams, illustrations, photographs and abstracts of cases are widely used to make the text as clear as possible. One very practical chapter is devoted to the wide variations in the pattern of adolescent development and a warning against overenthusiastic hormonal therapy during this period. Methods of study and diagnosis and tests for hormonal function and many methods are found in other chapters. At the end of each chapter there is an extensive bibliography.—Col. O. O. Brates, MC U. S. A.

**Urgent Diagnosis Without Laboratory Aid, A Discussion of the External Signs of Conditions Which Threaten Life** by Prof. Dr H. A. L. Baum, a. o. Professor of Internal Medicine University of Munich, formerly Medical Director and Physician-in-Chief, Hospital Munkel-Rehling. Publication No. 60, American Lecture Series. 80 pages. Charles C. Thomas Publisher, Springfield, Ill., 1940. Price \$2.

The subject matter in this book, devoted to what the physician can see, hear, smell, and feel in practically every disease and condition that might affect the human body is presented under the following headings: (1) nervous manifestations, (2) facial position, and attitude, (3) abnormal odors, (4) cutaneous manifestations, (5) disorders of respiration, (6) urinary symptoms, and (7) gastrointestinal manifestations. This monograph would be of particular value to the physician who wished quickly to review physical findings as an aid in differential diagnosis.—Col. A. E. Walter, MC U. S. A.

**Therapeutics in Internal Medicine**, edited by F. W. A. Kjaer, M. D., M. R. F. A. C. P. Associate in Medicine Northwestern University Medical School, Chicago. Attending Physician, Evanston Hospital, Evanston, Ill. 713 pages. Illustrated. Thomas Nelson & Sons, New York, N. Y. publisher 1939. Price \$12.

This work on therapeutics reflects the latest in this field of medicine. The editor is fully cognizant of the progress which has been made in the diagnosis and treatment of medical conditions and the impossibility of any single person possessing intimate knowledge of all forms of therapy has elicited the collaboration of 90 well-qualified physicians in the preparation of this treatise. The material in general is confined to treatment. Etiology, clinical descriptions, etc., are not included as these are available in many other works. In order, however, that the therapy may be properly correlated for certain diseases the physiologic principles, its variations and etiologic factors must be included and are found in certain sections. As the title implies only therapy for medical conditions is presented, and those conditions which are treated primarily by surgical procedures are not included. The book includes chapters on: (1) infectious diseases, (2) parasitic diseases, (3) diseases of metabolism, (4) diseases of the gland of internal secretion, (5) deficiency diseases, (6) diseases of the digestive tract, (7) diseases of the respiratory tract, (8) diseases of the cardiovascular system, (9) diseases of the blood and blood-forming organs, (10) diseases of the urinary tract, (11) diseases of the locomotor system, (12) diseases caused by allergy, (13) the role of adrenocorticotrophic hormone and cortisone in present day therapy, (14) diseases caused by physical agents, (15) diseases caused by intoxication, (16) diseases of the nervous system, and (17) skin diseases. Many presentations are followed by excellent up-to-date references. A large and complete index is found at the close of the volume.

—Col. C. R. M. H. MC U. S. A.

**Proctology in General Practice**, by *J. Peerman Vestcirod* B. S. M. S., M. Sc. (Med.) F. A. C. S., F. A. P. S. Associate in Surgery Northwestern University Medical School. Associate Surgeon, Division of Proctology Evanston Hospital, Evanston, Ill. Certified by the Central Certifying Committee in Proctology (Founders Group) of the American Board of Surgery. Commander MC USNL. 278 pages. Illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$4.

The subject is presented in a scholarly, interesting, and lucid manner. The book, although intended for use in general practice, is suitable for the student and practitioner of minor proctology. In the military service where anorectal work is such a large part of the general surgeon's total work volume. The first chapter deals with basic science relative to proctology. It is adequate and not in too much detail for the busy practitioner to read. The treatment of the subject of hemorrhoids is excellent. There is a brief but interesting chapter on malformations of the rectum and anus which is of more interest to military surgeons than formerly because of the increased number of dependents now being treated in service hospitals.

Many valuable suggestions regarding the diagnoses and treatment of various anorectal conditions are given. There are, however, no radical departures from the techniques used by most proctologists today but all the methods discussed are highly practical. The last chapter contains a discussion of that great time-consuming surgical affliction of the military man, pilonidal cyst disease. The author has had personal experience with the military aspects of the pilonidal cyst problem during the recent war while on duty as a naval medical officer. He states his preference for the Bule saucerization operation for the cure of pilonidal cyst conditions, for several reasons, one of which is a compromise in the time required for hospitalization. Although his stand on this question is definite, I doubt if his preference for this procedure will find favor with a majority of military surgeons. The style of writing and the legibility of the type make for facility and pleasure in reading.—*Commander W. Fry MC USN*

**Basic Principles of Clinical Electrocardiography** by *Hans H. Hecht* M. D., Associate Professor of Medicine University of Utah School of Medicine Salt Lake City Utah. Publication No. 87 American Lecture Series. A Monograph in American Lectures in Circulation. 88 pages. Illustrated. Charles C. Thomas, publisher Springfield, Ill., 1960. Price \$2.

In recent years a change has occurred in the approach to the interpretation of clinical electrocardiography from empiricism to a more rational one based on factual evidence. The author has sensed the need in this transition period for clarification based on a more definitive separation of factual evidence from theoretic assumption. This well-organized, clearly written monograph will prove of assistance to many by leading to an understanding of the relationships of the various leads. Following a short introduction separate chapters are devoted to unipolar semidirect unipolar limb and bipolar limb leads. Their relationships are clearly delineated. Explanation of the ventricular gradient spatial relationships and vectorcardiographic curves is properly though briefly included. The interrelationship of direct semidirect unipolar and bipolar leads is clearly defined and the simple reduction of many curves to combinations of three fundamental patterns is made easy. The text is well summarized in the last chapter. The list of references for supplemental reading is adequate. The glossary may be of value to the beginner. The illustrations are more than adequate, are clearly reproduced, and the book reflects credit on the publisher as well as the author.—*Col J. S. Taylor MC USA*

**Thoracic Surgery** by *Rick rd H Sweet* M D. Associate Clinical Professor of Surgery Harvard University Medical School. Illustrations by *Jorge Rodriguez Arroyo* M D. Assistant Surgical Therapeutics University of Mexico Medical School. 34 pages. Illustrated. W B Saunders Co., Philadelphia, Pa., publisher 1950. Price \$10.

The great advances which have been made in thoracic surgery in recent years and the increasing interest in and importance of this surgical specialty has created the need for a practical and authoritative textbook of thoracic surgery. To cover the subject adequately from all aspects would be a monumental task, perhaps beyond the capabilities of any single author. It is not one which Dr Sweet has attempted. His book is, rather, a manual of thoracic surgical technique and a such will prove a useful addition to the library of those properly qualified general surgeons who wish to acquire a basic knowledge of the various techniques employed in intrathoracic operative procedures. The book will also be valuable to students and practitioners who seek to familiarize themselves in a general way with the common thoracic surgical operations without going into the minutiae of technical details.

The opening chapter dealing with the surgical anatomy of the thorax is sufficiently detailed to make the operative procedures described in later chapters clearly understandable. There follows a discussion of general technical considerations and a description of the standard thoracic surgical incision. The remainder of the book is devoted to specific surgical procedures involving the chest wall, the pleural cavity, the lung, the mediastinum, the esophagus, the diaphragm, and intrathoracic operations performed through thoracic incisions. Operations on the esophagus a field in which Dr Sweet is an acknowledged master are particularly well covered. The section dealing with abdominal operations performed through thoracic incisions will be especially interesting and helpful to general surgeons.

The surgical principles set forth in this text are so sound and so well accepted that one hesitates to mention those few technical procedures the acceptance of which may be seriously questioned by those particularly interested in this field. It is only fair, however, to state that examples of such procedures occasionally appear in this book. In performing temporary phrenic nerve paralyzing operations, Dr Sweet advises that the nerve be "crushed thoroughly with hemostatic forceps for a distance of about  $\frac{1}{2}$  inch long in length. Many thoracic surgeons are convinced that such technique will lead to an unacceptably large number of unintentional and undesired permanent paralyses and believe that the nerve should be crushed over a distance of only 1 mm with a specially designed crushing clamp. Such controversial procedures but rarely however, and the procedures described are for the most part widely accepted among thoracic surgeons. The book is logically arranged, adequately indexed and well printed. The illustrations, chiefly original drawings by Dr J R Arroyo, are accurate and in some instances excellent.

—C. M. O'F. Hickey M D U S A

**Researches in Binocular Vision**, by *Ken th V. Ogilvie* Ph D. Section on Biophysics and Biophysics Research Research Laboratories of the Section on Ophthalmology M J Foundation and M J Clinic Rochester Minn. 64 pages. Illustrated. W B Saunders Co Philadelphia, Pa publisher 1950. Price \$7.50.

The world of ophthalmology and will continue to be indebted to the men of the research and to the brilliant and fruitful work of Dr Ken th V Ogilvie, for their research in binocular vision. The subject matter of this book is sum-

marization of a large part of the significant work of this Institute and the integration of this research with the general information on the visual processes. The bulk of this data is nonclinical and representative for the most part pure science. To appreciate this book one should already be conversant with the present concepts of normal and abnormal retinal correspondence, the Vieth-Müller theoretical horopter, the Hering-Hillebrand empiric horopter, the cyclopean eye, Panum's area, stereopsis, the schematic eye of Gullstrand, the relative image sizes in curvature and axial ametropia and Knapp's law for correcting lenses. Anyone with such a background will find this presentation beautifully clear and logical. The experiments are graphically presented. The deductions and inductions are gems of scientific analysis. The data is authoritative, provocative, accurate and enlarges our fundamental concepts of binocular vision. The subject of anisometropia is especially well presented.

—Itt Cowdr R P V *death MC U S A*

**Cranioplasty** by *David L. Reeces*, A. B. M. D., Consultant in Neurological Surgery, Santa Barbara Cottage Hospital, St. Francis Hospital, Santa Barbara General Hospital, Santa Barbara, Calif., formerly Instructor in Neurological Surgery, University of Southern California School of Medicine, Colonel Medical Corps, A. U. S. 110 pages, illustrated. Publication No. 29, American Lecture Series. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$3.

In this monograph from the neurosurgical division of American Lectures in Surgery the author reviews the history of skull trepanation and then describes the materials, methods and indication for cranioplasty. The operative procedures, including the method of forming the mold and tantalum plate are well described. Most of the case reports are of patients seen while on military duty and lack satisfactory follow-up. The increased number of cranial defects resulting from the present military operation will stimulate an interest in this subject. Four hundred and two references are listed.

—Itt Cowdr W H B *death MC U S A*

**On the Experimental Morphology of the Adrenal Cortex**, by *Hans Selig*, M. D., Ph. D., D. Sc., F. R. S. (C), Professor and Director of the Institute of Experimental Medicine and Surgery, University of Montreal, Montreal, Canada, and *Helena Stone*, B. Sc., Institute of Experimental Medicine and Surgery, University of Montreal, Montreal, Canada. Publication No. 4, American Lecture Series. 100 pages, illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$2.50.

This experimental study on rats by two authorities in the field of adrenal cortical morphology includes a discussion of (1) atrophy, (2) hypertrophy, (3) hyperplasia, (4) capsular adenoma, (5) storage and discharge of lipid, cholesterol, plasma, and ascorbic acid granules, (6) fatty metaplasia, (7) colloid formation, (8) fibroid degeneration, (9) cytolytic, (10) hemosiderotic, (11) lymphoid and myeloid metaplasia, (12) formation of lunula within the cortical parenchyma, (13) holocrine secretion, (14) hyperemia, (15) hemorrhagic infarction, (16) focal necrosis, and (17) toxic inflammation. It is interesting to note that following testosterone therapy there was pronounced sclerosis of the capsule and fatty metaplasia. The authors again demonstrated the reaction of ascorbic acid granules to alarming stimuli. They also found that the increase in adrenal weight caused by Lopholaima anterior pituitary tissue was directly proportional to the protein content of the diet in the experimental animal. They concluded that the adrenal cortex could respond to certain stimuli with various highly specific reactions.—Col F W Pruitt *MC U S A*

*McClung's Handbook of Microscopical Technique for worker in animal and plant tissues* by 37 authors. Edited by *Ruth McClung Jones*, Professor of Biology, Winthrop College, South Carolina. 3d edition, revised and enlarged. 70 pages, 15 illustrations. Paul H. Hoeber Inc., New York, N. Y. published 1940. Price \$1.

"There have surely been more changes in the field of microtechnic in the last decade than in any previous similar period. To incorporate these changes in the third edition of this well-known book has been the task of its editor. To cover these field fully would have resulted in an encyclopedic work. Part I, "General Procedures and Information," requires no introduction and no comment. It is well written and includes references to the newer reagents. Part II, "Special Procedures with Limited Application," is also familiar. The continued inclusion of various procedures for the enumeration of erythrocytes and other clinical pathologic techniques without discussion of their inherent errors might be questioned. Part III contains much of the new material, and here editorial prerogative has been exercised. There is an 86-page discussion of polarization microscopy by H. Stanley Bennett, with exhaustive treatment of certain phases of this method. Phase microscopy and fluorescence microscopy are considered briefly but the principles and technique of electron microscopy are mentioned only in a brief chapter concerned with the preparation of tissues for study by this method. There is no consideration of ultraviolet microscopic methods or of various other research techniques used in the field of submicroscopic morphology. These comments are not intended to detract in any way and merely represent segments which the reviewer wishes could have been included. The book will continue to be a standard reference in all laboratories where not but the simplest types of histologic examinations are made—*Li Col. W. D. Tigert, MC U. S. A.*

*Thromboembolic Conditions and Their Treatment With Anticoagulants*, by Charles D. Apple, M. D., Assistant Clinical Professor, Division of Medicine, University of California Medical School, San Francisco, Calif., formerly Research Fellow, Department of Medicine, Cornell University Medical College, and Assistant Physician: Our Patients, The New York Hospital, New York City and *Irving S. Wright, M. D.*, professor of Clinical Medicine, Cornell University Medical College and Attending Physician at The New York Hospital, New York City. 418 pages illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$5.50.

This is a complete and up-to-date presentation of thromboembolic conditions and their treatment with the anticoagulant agents. The senior author was director of an anticoagulant study made by the American Heart Association. The subject is discussed comprehensively from the physiologic, therapeutic, and laboratory viewpoints. The incidence and occurrence of thromboembolic phenomena in various clinical conditions, the mechanisms of intravascular clotting, the causes of clotting, and the morphologic development of thrombi are considered. There follows an excellent discussion of the rationale and clinical use of the anticoagulants; the methods of administration of heparin and dicumarol, the reasons for therapeutic failures, and the physiologic effects of the anticoagulant agents. The bases of therapy revolve themselves mainly in poor or no clinical laboratory control with the use of the anticoagulant drugs. The last section of the book describes the laboratory procedures used in the determination of the coagulation and prothrombin times and protamine titration. Throughout the book extensive reference is made to the literature. Both lines of controversial subjects are presented.

The use of the anticoagulants in the treatment of pulmonary embolism, venous thromboses, sudden arterial occlusion, coronary occlusion myocardial infarction, rheumatic heart disease with auricular fibrillation, and retinal venous occlusion is evaluated. The prolonged administration of anticoagulants is discussed and the newer anticoagulants are described. A section is devoted to recent developments since the preparation of the original manuscript. In this section the authors have gathered all the latest facts culled from the most recent publications.

This is the most comprehensive and inclusive treatise on the subject of thromboembolism now available. It contains not only fundamental information but also appraises the most recent developments in this field. It is gratifying to see a masterful work on this timely topic which enters the realm of every practitioner of medicine. A complete bibliography is printed at the end of the book.

—Commander H. A. Lyons, MC USN

**The Nose, An Experimental Study of Reactions Within the Nose of Human Subjects During Varying Life Experiences**, by *Thomas H. Holmes, M.D.* *Lester A. Hofheimer* Research Fellow in Medicine *Helen Goodell B. S.* Research Fellow in Medicine *Stewart Wolf M.D.* Associate Professor of Medicine, and *Harold G. Wolff M.D.* Professor of Medicine (Neurology) Cornell University Medical College, New York, N. Y. With a foreword by *Warfield T. Longcope M.D.* Professor Emeritus of Medicine The Johns Hopkins Medical School, Baltimore Md. 154 pages illustrated. Charles C. Thomas, Publisher Springfield, Ill., 1959. Price \$4.00.

The purpose of this monograph is to report and interpret results of an experimental study of disturbances in nasal physiology occurring in response to a variety of situational threats. The authors review nasal physiology and its range of normal variation. The response to various physical stimulants is described and the correlation of these changes to changes resulting from interpersonal relations is drawn. In reactive persons with conflicts and with feelings of humiliation, frustration and resentment, the mucous membranes of the nose showed initial redness with marked swelling of the conchas and nasal mucosa profuse secretion and obstruction. Situations productive of fear with minimal conflict, of dejection and disgust and of erotic feelings accompanying sexual activity when conflict was absent were associated with vasoconstriction and pallor in the nasal mucosa, decreased secretion, and shrunken conchas. Situations involving interpersonal and social adjustment may modify the course of nasal morbid processes regardless of the precipitating incident.

—Lt. Comd. W. H. Howell, MC USN

**The 1960 Year Book of Pediatrics**, edited by *Henry G. Poncher M.D.*, Professor and Head, Department of Pediatrics College of Medicine University of Illinois, with the collaboration of *Julius B. Richmond M.D.*, Associate Professor Department of Pediatrics, College of Medicine University of Illinois. *Isaac A. Ibl M.D.* editor emeritus. 464 pages illustrated. The Year Book Publishers, Inc., Chicago, Ill., publisher 1960. Price \$5.

The 1960 printing marks the fiftieth anniversary of this Year Book, which first appeared in the Practical Medicine series. The present volume includes sections by Julius Hess, Meredith Campbell, Albert Sabin, Leo Taran, Helen Tausig, Harold Dargatzis, and others. Guest editorials, including a discussion of pediatric progress in the United Kingdom, are presented. The section on the newborn, nutrition, metabolism, the gastrointestinal tract, infectious diseases and immunity, the cardiovascular system and neurology and psychiatry are excel-

lent. That on urology I discuss (mostly brief. A excellent review of chemotherapy in tuberculosis in children I provided by Edith Lincoln. A short section on polyomyelitis I presented. Unfortunately a minimum of space is allotted to the problem of rib sensitization I the section on the blood. Post problems and the prevention of acquired gait abnormalities receive appropriate attention under orthopedics. Therapeutics and toxicology are suitably covered.

—*Commander N Kartak, MC U S N*

**A Textbook of Histology Functional Significance of Cells and Intercellular Substances** by *E I Coady* Professor of Anatomy The School of Medicine, Washington University St. Louis, Mo. 4th edition, thoroughly revised. 640 pages. Lea & Febiger Philadelphia, Pa. publishers, 1930. Price \$3.50.

In this fourth edition of one of the recognized textbooks of histology the author has correlated many of the biochemical and physiological aspects of microscopic anatomy. This book facilitates the modern teaching of histology by its inclusion of data on teaching films of histologic interest, data on books relating to the basic medical sciences which are yet in press, and an extensive bibliography. Each chapter is summarized and sample questions are included relating to the data it covers. A list of National Board questions in the field of histology is given. Staining formulae and tissue fixing techniques are discussed and new advances in micro-copy are illustrated by excellent photomicrographs.

—*Lt (jg) D B Carmick, Jr, MC U S N*

**Principles and Practice of Surgery** by *Jacob K Berman, A. B., M. D., F. A. C. S.* Associate Professor of Surgery Indiana University School of Medicine Associate Professor of Oral Surgery Indiana University School of Dentistry Chief Consultant in Surgery Billings' Veterans' Administration Hospital Fort Benjamin Harrison, Ind. Director of Surgical Education and Surgical Research, Indianapolis General Hospital. 1878 pages 450 illustrations. The C. V. Mosby Co., St. Louis, Mo., publisher 1930. Price \$15.

Although this textbook is written primarily for the medical student, it will be found helpful by surgical interns, residents, and surgeons. The author lists a number of maxims or aphorisms such as A good surgeon is an internist who performs operations, which if followed by all surgeons would elevate the level of surgical practice. His emphasis on etiology diagnosis, biochemistry pathology and physiology and his correlation of the basic sciences with clinical surgery makes this work an outstanding contribution. The chapters devoted to the interchange of body fluids, acid-base balance hemorrhage and shock are well written and readily applicable to practical surgery. Surgical technique is not dealt with in any detail. This book truly represents the physiologic era of surgery.

—*Lt Commander R. L. May, MC U S N*

**Differential Diagnosis of Internal Diseases, Clinical Analysis and Synthesis of Symptoms and Signs**, by *J Hae Bower M. C., F. A. C. C.* Clinical Professor of Medicine College of Medical Evangelists, Los Angeles Senior Attending Physician, Los Angeles County General Hospital Consultant in Medicine, Whit Memorial Hospital, Long Beach Veterans' Administration Hospital, and Cedars of Lebanon Hospital, Los Angeles formerly Professor of Medicine University of Vienna. 866 pages Illustrated. Grune & Stratton, New York, N. Y. publishers, 1930. Price \$12.

This interesting, well written book is a successful attempt on the part of the author to accomplish his mission, which is to set forth concisely a "clinical analysis and synthesis of symptoms and signs." The book is divided into two parts, the first dealing with leading symptoms referable to the various systems of the body and the second with leading signs referable to the various systems, the general appearance of the patient and the significance of deviations from normal commonly seen. The book is comprehensive and the remarks made are for the most part sound. The author has had a great deal of clinical experience which he has coordinated with current concepts of the disorders discussed.

—Col W O Berry MC U S, A.





# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
Agency, Department of Defense*



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ROBERT J. BENFORD, *Colonel U S A F (MC) Associate Editor*

THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY  
THE DIRECTOR OF THE BUREAU OF THE BUDGET OCT 19 1949

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON 1951

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

The Director Medical Services, and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army Navy and Air Force to submit manuscripts for publication in this JOURNAL.

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Address: 1. *U. S. Armed Forces Medical Journal*, Bureau of Medicine and Surgery, Department of the Navy, Washington - D. C.

FRANK W. FARRAR, *Editor in Chief*

*Captain, Medical Corps*

*United States Navy*

WAYNE G. BRANDSTADT, *Associate Editor*

*Colonel, Medical Corps*

*United States Army*

ROBERT J. BARNFORD, *Associate Editor*

*Captain, Medical Corps*

*United States Air Force*

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With this issue the Armed Forces Medical Journal begins its second year of publication. It already has taken its place as a valuable part of medical literature both in this country and in other countries.

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Richard L. Milling, M. D.  
Director of Medical Services

# UNITED STATES ARMED FORCES MEDICAL JOURNAL

Volume II

January, 1951

Number 1

## The Neurotic Potential, the Neurotic Process, and the Neurotic State'

JAMES T. S. KUBIE, M. D.

THERE is still a widespread tendency to regard all neurotic difficulties as something curious, strange, and alien. The neurotic process is as inevitable a part of human development as speech and breathing. It arises out of the *neurotic potential* which is a universal phenomenon, apparently peculiar to man and highly charged with possibilities for both good and evil. The *neurotic process* which has its roots in this human potential may exist for years in masked forms, but crystallizes ultimately either in episodic *neurotic states* or as a persistent symptomatic neurosis. The understanding of the role of neurotic phenomena in human life began with the clinical study of symptomatic neuroses; yet these dramatic and more easily recognized manifestations of the neurotic process are less prevalent and less culturally significant than is the more universal *concealed neurotic process*. To each patient his own clinical neurosis is of enormous importance primarily because it causes him illness and suffering. His neurosis hurts him but his neurotic process hurts those around him. He must save himself from his neurosis. His family, his friends, and sometimes society as a whole must protect themselves from his neurotic process. Therefore the masked process is of primary importance to society in general.

Presented at the Monthly Medical Meeting, Army Medical Center, Washington, D. C., April 1950.

(Clinical Professor of Psychiatry and Mental Hygiene, Yale University)



## THE CONCEPT OF NORMALITY AND OF NEUROSIS

Only single acts and moments of life will be discussed here, not the normality or abnormality of a whole personality. Our concepts about individual moments must be clear before personalities as a whole can be discussed profitably. If there is agreement on the simpler problem, there will be some hope of reaching clear agreement about the more complex issue later.

*What normality is not*—Alan Gregg has said that the best way to describe something is to begin by explaining what it is *not*. For instance, the concept of normality has nothing to do with statistical prevalence. Because something happens frequently does not mean that it is normal. Cavities in the teeth are not normal merely because 99 percent of the population have them. The common cold is not normal even in a pandemic. The statistician's concept of a "norm" has nothing to do with "normal" as an index of human well-being. Nor is normality identical with usefulness. A neurotic compulsion to do good is at least as frequent as a neurotic drive toward immoral or destructive behavior. That is fortunate, since otherwise the world would be in an even worse fix than it is. Indeed some of the most useful activities in the world have been performed under the urgent pressure of neurotic drives. Nor has normality anything to do with a sense of comfort. A person can have a severe height phobia but if he lives on a flat plain where there are no hills or tall trees or high buildings, he will not be aware of this, and he will feel entirely comfortable. Many a kleptomaniac can make himself comfortably in a wealthy woman's shopping compulsion. I have seen a severely perverted sexual compulsion diverted both comfortably and usefully to the practice of gynecology. Nor is normality identical with lovableness, because many neurotic qualities may enhance a person's appeal as for instance the neurotic dependence of certain attractive women. Again normality is not identical either with conformity to any particular culture or convention or with rebellion against it. For many persons conform for neurotic reasons or rebel for neurotic reasons to use either as an index of normality.

Normality is not identical with or measurable by success. Of this, the most dramatic evidence is the frequency with which men react to success by going into severe depressions. One sees this at all levels and in all forms of work and play. We see it in the tennis player who can never let himself win important tournaments from men he can always defeat in practice. We see it in the businessman who goes into a depression when he earns a million dollars, in the writer who commits suicide when his novel becomes a best seller, in the man or woman who reacts to the launching of what should be a happy marriage by deep and destructive gloom. The world did not have to wait

for psychiatry to discover how often success and fame turn to ashes but psychiatry has given us some understanding of the reasons for this all too-frequent human tragedy

Finally normality is not clarified by the legal effort to define something called "moral responsibility" nor by the law emphasis on the importance of knowing the meaning of what we do. Psychotics may have a heightened sense of moral responsibility and may understand as well as clergymen the moral implications of what they do

*What neurotic does not mean*—To be neurotic is not identical with being queer or eccentric or unusual or rare or illegal or unconventional or rebellious or submissive or foolish or weak or useless.

*The essential difference between normal and neurotic*—The definition offered here will be in terms solely of the unstable, dynamic equilibrium between conscious and unconscious psychologic processes which operate continuously to determine the quality of human conduct. A distinction which is based on this is the only one which takes cognizance of a fact which is well known to us clinically namely that there is literally no single thing which a human being can think or feel or do which may not be either normal or neurotic and more often a mixture of the two and that the degree to which it is one or the other will depend not on the nature of the act but on the nature of the psychological forces which produce the act. This is true of work and play of selfishness and generosity, of cleanliness or dirtiness, of courage and fear of a sense of guilt or a sense of virtue of activity or indolence, of extravagance or penuriousness of ambition or indifference, of ruthlessness or gentleness, of conformity or rebellion of playing poker or writing poetry and even of all supposedly simple instinctual acts. Determining each of these is a continuous interplay of conscious and unconscious psychologic forces and it is the balance between the conscious and unconscious components of this flux which determines the degree of normality or the degree of neuroticism of any act or feeling or trait

The following facts are basic (1) In every moment of human life our conduct our behavior our thoughts and our feelings our decisions and plans our hopes and purposes and our reactions to one another are determined by a complex group of psychologic processes. (2) Of some of these psychologic processes we are fully conscious whereas of others we are wholly unconscious, and cannot become conscious of them without the aid of special methods of investigation and evaluation of which psychoanalysis is the pioneer and still the most important. (3) This basic fact namely that man operates psychologically on at least two levels is of more than academic interest. It has fundamental and practical importance in human affairs because the consciously and unconsciously organized levels of the per-

sonality have different characteristics, and exert quite opposite influences on behavior to wit:

That conduct which is determined predominantly by conscious processes is flexible and realistic. Because its motivations are conscious, they can be influenced by conscious appeals to reason and feeling by arguments and exhortation, by success and failure, by rewards and punishments. In short, there is present the capacity to learn from experience. Therefore, normal behavior is in the truest sense of the word free, i. e., free to learn and to grow in wisdom and understanding.

In contrast to this, that behavior which is determined by a preponderance of unconscious processes is rigid and inflexible. It never learns from experience. It cannot be altered by argument or reason or persuasion or exhortation or rewards or punishment, and not even by its own successes and failures. Because of its very nature it can never reach its unacknowledged and unrecognized goals. It is inevitable and endlessly repetitive, repeating its errors as often as and perhaps even more often than its successes, and marching rigidly ahead on blind and stereotyped paths. This happens whether the pattern of behavior has brought success or failure, and whether it has been a source of happiness or of unhappiness either to itself or to others. Thus neurotic behavior is a state which precludes learning. It cannot change or develop or grow. It is enslaved.

It would be a mistake to assume from this that any act or thought or feeling is determined exclusively by conscious or exclusively by unconscious forces. Instead a mixture is always at work and our picture of the neurotic process derives from this fact. Whenever the predominant psychologic forces are conscious, the resulting conduct will merit being called *normal*, because conduct so determined is free to be affected by experience and the person is capable of adapting flexibly to changing external realities. On the other hand, when unconscious forces dominate, or when conscious and unconscious forces pursue incompatible goals, then the behavior which results will deserve to be called *neurotic* precisely because it will be a rigid, repetitive, ineffectual compromise, serving the needs of neither conscious nor unconscious aspirations and motivations.

If these statements are valid, then we may state categorically that if there were no such thing as unconscious psychologic processes there would be no neuroses. There would not be those outspoken clinical neuroses which manifest themselves in obvious symptoms with which we deal in daily practice as the symptomatic psychoneuroses. Nor would there be those masked neuroses which express themselves insidiously in distortions and exaggerations of the customary patterns of living nor in those quirks which are looked on as the eccentricities

ties of normal people nor in those neurotic processes which result in delinquency

*The unconscious* —When we speak of unconscious psychologic processes, we may mean psychologic processes of which we are unaware but which are readily accessible to conscious self-inspection or we may mean processes of which it is impossible to become aware without the help of special instruments. The two categories of unconscious activity develop differently and have different significances. Those of which we can become aware have dropped out of the field of consciousness simply through repetition. Thus all of the simplest activities of life such as breathing, sucking, excreting, moving, and crying were originally random and often explosive acts. Early in life their purposeful execution is learned through repetition by which they become economically organized into synergistic goal-directed patterns. As any such act is fully learned it can be initiated simply by the contemplation of the goal and as this happens we gradually become unaware of the intermediate steps which make up the act. This great economy is achieved in the process of learning by repetition. It is in this way that we become able to walk without pondering each step to talk without working out the movements by which we enunciate each word. It is in this way that the violinist and the juggler and the athlete learn complex chains of synergic movements. It is in this way that our thinking processes acquire seven-league boots, i. e., the ability to leap over many intervening steps as we perform complex arithmetical processes. This is the source of intuitive thinking whether in science or the arts. In each case the intermediate steps drop into the background and disappear from consciousness. Yet they remain accessible to conscious self-examination. They are what William James would have called the "fringe of consciousness," or what Freud called the preconscious or the descriptive *subconscious*, as contrasted with the *dynamic unconscious*.

The dynamic unconscious, however, is no mere limbo of shadows; it is an area of hidden force or rather of whole constellations of forces in psychic life. Such unconscious processes are constantly at work in our lives yet we cannot become aware of them by ordinary method of self-observation because they are hidden from us by vigorous opposing forces within ourselves. Throughout life these processes exercise a powerful influence on human behavior and it is out of their influence that everything that is neurotic in human affairs has its origin. In this sense everything that we say and do and think and feel serves multiple functions and represents symbolically both the conscious and unconscious levels of psychologic organization. From this we may go further and conclude that if the psychologic conflicts of infancy and childhood could take place in the full light of con-

consciousness, then the neurotic process could never be launched in human life.

Why we "repress" certain psychologic processes in such a way as to render them unconscious is a question which will not be discussed here beyond pointing out that it happens whenever conscious or unconscious feelings of guilt and fear make it impossible for us to discharge internal tensions. When this situation arises we automatically render unconscious the tensions born of conflict and then express them in disguised symbols, in the symptoms of the *neurosis*.

#### THE SYMBOLIC PROCESS AND THE NEUROTIC POTENTIAL

Thus the symbolic process which I have in mind includes far more than the symbolism of dreams, which is only a special instance. The human being is capable of two related but different types of symbolic process. One gives him the ability to derive abstract concepts from his experiences, to represent these abstractions in symbols, and thus to express and communicate his purposes, needs, thoughts, and feelings through gestures, sounds, words, and their written symbols. The other symbolic process is the one by which man expresses in disguised forms those psychologic tensions which he is unable either to discharge or to face. The first is the symbolic process of self-expression and of communication through language; the second is an unconscious effort to set misgivings at rest through the symbolic process of self-deception. In the developing infant and child these two symbolic processes have a common origin, and the ability to represent internal experiences through various forms of symbolic activity is the *sine qua non* equally of the neurotic process and of speech. It is not clear whether among lower animals either symbolic process is possible to a significant degree. This is why it is doubtful whether the so-called experimental neurosis in animals, which actually is an emotional disturbance that may occur in human neuroses as well, is identical with the neurotic process itself.

Between the two forms of symbolic representation there is a difference about which we can be quite specific. The difference between the representational process in communication and the representational process in the neurosis is primarily the difference between using a symbol for an internal experience of which we are or can be aware and using a symbol to express an internal experience of which we are unable to become conscious. The capacity to create and use symbols is identical in both and is essential in both. The difference resides solely in the fact that the relationship of the symbol to the underlying psychologic process is conscious in language, and unconscious in the neurosis. Consequently the roles of the symbolic representative of those two types of "unconscious" experience differ. In speech the

symbol is like the salesman who represents a firm that is doing a legitimate business. This salesman saves the heads of the firm much time and energy because they do not have to visit every customer themselves, yet these principals are known to the customers and can always be reached by them. On the other hand there is another kind of "salesman," i. e., the representative of a gang of criminals, or the secret agent of a foreign country. Even if he is captured, and even if it is known that he is the agent of criminals, he will not divulge their identity or whereabouts except under pressure if at all. In the neurosis the relationship of the symbol to the inaccessible unconscious processes which it represents is of this nature. Therefore we must repeat that if human beings were not able in the first place to abstract their psychologic processes and in the second place to represent these abstractions symbolically and if in the third place they were not able to render certain unacceptable psychologic processes inaccessible to conscious introspection there could be no such thing as a neurosis. Together then these three human capacities constitute the neurotic potential.

Thus this human vulnerability to the neurosis, i. e., the neurotic potential arises out of our capacity for symbolic psychologic function without which there could be neither a neurosis nor a thinking process, but merely dreamlike sensory imagery, passive echoes of previous perceptions. Like the neurosis, painful action and speech require symbolic processes by means of which sensory imagery can be taken apart and reassembled in new combinations.

### THE NEUROTIC PROCESS

Out of this matrix the *neurotic process* emerges gradually and progressively. For each child, it starts the first time when some psychologic experience becomes too painful to think about. Hence it becomes repressed to such an extent that all that is accessible to conscious introspection and all that shows to the world is some combination of thought and behavior and feeling which stands as a symbol for what is buried. This representative or symbol will be simple at first but with the passage of time and the gradual accretion of new buried problems which are more or less related to the first one the initial symbol can come to represent many hidden psychologic states and in turn there can be representatives of representatives, symbols of symbols of symbols, so that as the neurotic process evolves the ultimate linked chain of unconscious symbolic representatives can become very complex.

### THE NEUROTIC STATE

The crystallization of the neurotic state out of the neurotic process may be illustrated with a few cases. A courageous, artistic, and

musical woman in her late fifties had been brought up in a cultured home. Through her attachment to her father—a man of learning, she had developed a spontaneous interest in literature and the arts. During her early years these preoccupied her almost to the exclusion of social life, but in later adolescence she married an older man of similar tastes and interests who had been one of her father's outstanding students. It was a good marriage and she gave herself to it wholeheartedly and happily. There were no portents of difficulty except for a few "harmless eccentricities" of taste and dress. The years went by, however, and in the course of time her husband died, one son was killed in the war and two of her children had to live on the other side of the world. All of this she weathered, but when her youngest daughter made a happy and suitable marriage the woman broke down and had to seek help. Retrospectively it then became clear that her devotion to literature and the arts and even to her family had served two groups of inner purposes—one healthy and the other neurotic. From her early years she had suffered from a secret fear of social challenges. In early childhood she would always vomit before going to a children's party. Without realizing it her studies, her marriage, her home, her children, and her intellectual and artistic interests, and the eccentricities referred to above had served to mask her phobia almost completely. Consequently during the long happy years of her marriage, she had been wholly unaware of her lurking neurosis, and it was not until the defense provided by home and family was removed that she again found herself confronted by the unresolved neurotic terrors of her childhood. When this happened, the severity of her anxiety in all social situations forced her to retreat into an unwanted isolation. Her loneliness now depressed her so that she lost her ability to enjoy even the inanimate beauty of music, paintings, or a sunset. Gradually she developed various psychosomatic disturbances, an intractable insomnia, and finally a profound depression. Eighteen years of happy marriage had served her family and community well, but had served the patient badly indeed by making the highly charged neurotic process which was the hidden legacy of an untreated and unresolved childhood neurosis.

Another woman had grown up with an intense and hostile rivalry with her older brother of which, however, she was totally unconscious. Because the original hostility was unconscious, he failed equally to realize that it had spread to include himself so that every relationship with a man was poisoned by unconscious hatred. Burdened with a confused inner conflict, in her early adult years this rivalry had manifested itself in the life of a socially active bachelor girl, with tented writing and a vigorous participation in liberal politics and other community affairs. Ultimately, however,

this same hostile rivalry with men led her to marry a gifted but weak man who turned out to be impotent. Again because she had not realized the antecedent steps, she did not realize that she had been drawn to him by the weakness which was a part of his impotence and which both frustrated her and intensified her secret feelings that to be a woman is to be unlovable. After 2 years of this, her seemingly stable adjustment broke down. Her previous activities could no longer serve their original unconscious purposes. She shut out her many friends, turned away from all community activities, became completely blocked in her writing and lapsed into a severe neurotic depression.

These examples should make it clear that in spite of a virtual absence of any of the conventional signs and symptoms of a clinical neurosis an unconscious process may be at work below the surface the neurotic nature of which proves itself as soon as appropriate circumstances light up the patient's deep problems.

As a last example of how the clinical neurosis, i. e., the neurotic state, can crystallize out of the masked neurotic process which I have tried to describe I shall trace the relevant fragments in the life of a little boy from his early years to the precipitation of a frank neurotic episode at the age of 11 years. The child was brought up by intelligent parents who gave him a great deal of thought and attention. Because of the mother's prolonged illness, however, he was left alone a great deal during his first 2 years and had less than the optimal amount of stimulating contacts with human beings. What contacts there were were good, but they were not consistent. As a result he developed as a sober slow moving cautious infant and toddler. This quality colored his neuromuscular and emotional responses for many subsequent years.

As time went on first a brother and then a younger sister were born spaced at about 2 year intervals. In each case the parents made active efforts to help the boy to accept his natural jealousies and to compensate him for whatever he might feel that he was losing through the birth of these young rivals. His responses to the birth of his brother were excellent. The birth of the sister however initiated a more difficult phase in his development. It occurred at that period in life in which it is usual for the first wave of curiosity about bodily matters to reach a peak, focusing sharply on the bodies of parents. This youngster had made many frank and unashamed efforts to inspect them closely and he had inspected himself and his new infant brother for comparative purposes. He did this as naturally and with as little guilt as if he had been comparing toys or colors or clothes or puppy dogs or anything else in his environment. The birth of his sister however brought an unhappy change in this.



During his mother's third pregnancy his curiosity shifted from the outside of the body to the inside, i. e., to what was going on inside his mother's body. Thus on one occasion he said frankly that he wished that she had a window in her stomach so that he could see what was going on inside, and when he heard that the baby had been born, he complained, "But it couldn't be. I wasn't there to see." This shift in interest automatically brought its own frustrations to which was added a chain of events, to which he reacted with feelings in which unconscious forces came to play a preponderant role. The first event occurred on the day of the mother's return from the hospital when she developed a severe infection and had to return to the hospital at once with the new infant. Thus to the boy it seemed that she came home bringing the baby and then disappeared with the baby almost immediately. Thereafter she was sick and delirious for nearly 2 months, during which time she was too ill to see the boy.

This initiated many changes, which had a bearing on his ultimate neurosis and from them I shall select those which best illustrate my theme. First the boy developed a strong aversion to touching or being touched or kissed by either parent but more particularly by his mother whom he rejected completely when she finally recovered sufficiently to be brought home. He said to her: "You are not my mommy. You are just a baby's nurse. Daddy's my mommy" (a role his father had faithfully tried to play during the long and anxious weeks of the mother's serious illness). Soon thereafter on a few occasions the boy insisted that he must grow up to be a lady himself so that he could marry his father.

He showed hostility to the baby sister chiefly by shutting her out entirely. Indeed he would hardly look at her. If looks could kill became a literal danger to him, and looking became a forbidden and a hostile act. If indeed the earlier manifestations of an eager and intelligent curiosity about the world around him became totally inhibited. He developed a transient eye-blinking tic, and became acutely shy both with adults and with other children, hanging his head with uncertainty and diffidence in manner and voice. He became more imaginative and more reclusive with a preference for solitude. Clearly these changes were symbolic manifestations of the unconscious conflict with which he was struggling. Because his parents failed to realize until much later the roots of his difficulty they limited their therapeutic efforts to the usual common-sense devices for restoring his relationship to his mother and recapturing his earlier natural ease with others. These attempts had only limited success, and the impact on his personality of these buried early experiences persisted. This was the neurotic process at its inception and at work.

When he was 11 an episode happened which precipitated a minor but more acute episode. During a school holiday it was noticed that his earlier eye-blinking had recurred in an exaggerated form and in addition he now expressed a great deal of anxiety lest something happen to his eyes. For instance he wanted to know what would happen to the other eye if an Indian should shoot an arrow in one eye. This puzzled his parents. There even was talk about whether or not he needed glasses but a lucky incident brought to light the immediate precipitant of the symptom. By chance they happened to ask him about a little boy who had been his best friend in school. The younger sister replied "I never see him any more. He is a dirty little boy." Since his parents had never told the child that anything was dirty this surprised them and they asked him why he said this. He answered that it was because his little friend frequently tried to peek through the windows into the girls' washroom. This clarified the problem. The angry and jealous curiosity which he had repressed for all the years since his mother's last pregnancy, his sister's birth and his mother's long illness had been reactivated by his friend's natural act. To see others do what we ourselves want to do but will not allow ourselves to do always stirs our own repressed impulses. Therefore he had had to reject his little friend precisely as he had repressed his own natural curiosity. The pressure of the unconscious conflict was now so great however that it had to be expressed in certain specific protective symbolic thoughts and acts, i.e. the protective eye-blinking and the obsessional fears of injury to his eyes.

Let me carry the story a little further. Immediate symptomatic relief was easy to give. The parents talked to the boy in simple terms not about his symptoms but about the universality of curiosity about the body, telling stories about themselves and their own surreptitious peeping when they had been his age and so forth. That night the little boy dreamed an interesting dream about an airplane with two round bulges in which he could not tell whether he was looking at the front or the back or at the top or the bottom of the plane. After this his eye-blinking and his obsessional concern over eye injuries disappeared with remarkable speed. Thus the parent had relieved that fragment of the boy's unconscious guilt which had its origin in his conflict over his pubescent erotic impulses. Unfortunately they did not at the time realize or deal with the supercharge of destructive hostility which in earlier years had attached itself to his sexual curiosity and because this hostile component was not brought to light at this time it left difficulties in his adjustment which had to be dealt with later.

What does this story tell us? We see the neurotic potential as an essential part of this child's fundamental human equipment for life.

A sequence of successive repressions then occurred in areas of highly charged conflicts and these repressions shaped his developing personality and blocked and warped his interpersonal relationship and even interfered with his intellectual development. Thus for a long time it even interfered with his use of his eyes in reading and studying. Finally when something happened to touch a match to the timber pile the buried problem erupted in the form of a typical acute neurotic episode of childhood. Thus out of the potential came the neurotic process, and out of the neurotic process crystallized the neurotic state as a series of symptomatic acts and fears which represented symbolically the boy's guilt laden and fear laden struggle with erotic and destructive impulses of which he had been unconscious. In a remarkably clear and condensed form this story seems to me to demonstrate my thesis, namely that the neurotic potential exists as an inevitable consequence of our essentially human capacity to represent symbolically all psychologic experiences, even those of which we are ourselves unconscious; that the neurotic process is an equally natural evolution out of this neurotic potential under the influence of unconscious guilt and fear; and that the symptomatic or clinically categorized neurotic state is nothing more than an episode which may be transitory or recurrent or persistent but in which the automatic symbolic language in which our unconscious struggles seek expression are accentuated and highlighted.



# The Significance of Heart Murmurs in Induction Examinations<sup>1</sup>

RICHARD I. J. HENSON, C. 10, I. H. C. R. 1

THE value of auscultation and especially the significance of murmurs has been subject to wide swings of opinion in the past. When Laennec invented the stethoscope in 1819, he started a pendulum of opinion swinging that even today has not become stationary. At the beginning of the century a murmur was often overrated. Mackenzie,<sup>2</sup> in a reaction to this state of affairs said that the stethoscope had done more harm than good to medical practice. He concerned himself with the functional efficiency of the heart rather than with structural abnormalities. Since about 1900 it is believed that Mackenzie was in error. We now know that structural abnormalities are important and may result in cardiac failure. Our present position is a reaction to Mackenzie and today we put much stress on the finding of a murmur. We have however learned to differentiate a physiologic or insignificant murmur from a pathologic or significant one. During the last war 10 percent of the rejectees had cardio-

<sup>1</sup>Read before the Armed Forces Medical-Military Symposium of the Fourth Army, 6 April 1944, Brook Army Medical Center, Fort Monmouth, N. J.

<sup>2</sup>Brook Army Hospital, No. 1, Fort Monmouth, N. J.

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vascular disease. Of these, 60 percent had rheumatic heart disease and 91 percent had hypertension.<sup>12</sup> The most important aids in cardiovascular diagnosis were auscultation and blood pressure determinations.

The question often arises whether a sound at the apex is a systolic murmur or only a muffled or prolonged first heart sound. Heart sounds do have variable durations.<sup>13</sup> When listening to systole and trying to detect a murmur it must be decided when the first sound ends and whether there is a further sound following it. The important point is that this extra sound has a definite duration, occupying for example, at least one-fourth of systole before we can be sure it is a murmur and not a part of the preceding first heart sound.<sup>13</sup>

Having found a murmur it must be analyzed. *First* is it systolic or diastolic, where is it of maximum intensity and in what direction is it transmitted? This is of the greatest value in localizing its origin. *Second* what is its intensity? Murmurs can be classified on the basis of intensity into grades from I to VI.<sup>13, 14</sup> Grade I is very slight. Grade II is slight; Grade III is moderate. Grade IV is loud. Grade V is very loud and Grade VI is so loud that it can be heard when the stethoscope is removed a short distance from the chest. The distinction between Grades I and II is that Grade II can be heard immediately while Grade I can be heard only after listening intently for several beats.<sup>15</sup> The majority of murmurs will be Grade II, III, or IV. This does not imply that the loudness of a murmur is directly related to the severity of a valvular lesion but a loud systolic murmur is usually significant whereas a slight systolic murmur is usually not significant.<sup>16</sup> Because auscultatory findings are subjective it is advisable to have every abnormal finding confirmed by at least one other member of the examining team whenever this is practical.

ROBERTO L. M. K. H. and FOR H. H. H. of Selective Service  
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72 720, Dec 1927

Because, with few exceptions, a diastolic murmur means organic heart disease and is, therefore, automatically a cause for rejection, we shall concern ourselves mainly with the more controversial systolic murmurs, except to emphasize a few points concerning the important diastolic murmurs of mitral stenosis and aortic regurgitation.

At the apex a diastolic murmur ordinarily signifies mitral stenosis, but not infrequently the murmur of aortic regurgitation may be heard there. An important differential point is that the diastolic murmur of aortic regurgitation comes immediately after the second heart sound without any pause while that of mitral stenosis comes



*Figure 1—Physician using the bell chest piece with the patient in the left lateral decubitus position, after an exercise sufficient to accelerate the heart rate to facilitate hearing a faint diastolic mitral murmur*

only after a short interval of silence. No examination of the heart is complete in ruling out mitral stenosis unless the apex has been listened to with the patient in the left lateral decubitus position, after an exercise sufficient to accelerate the heart rate and using the bell chest piece of the stethoscope (fig 1). The presence of a forceful first sound at the apex, or a prominent or reduplicated second sound in the pulmonic area, should arouse suspicion of mitral stenosis. Caution

should be observed in diagnosing mitral stenosis solely on the presence of a late diastolic or presystolic murmur.<sup>22, 23</sup> It is always better to identify the middiastolic rumble preceding the presystolic murmur before diagnosing definite mitral stenosis.



*Figure 2.—Physician using the diaphragm chest piece with the patient standing, leaning well forward and in deep expiration to facilitate hearing faint diastolic murmur along the left sternal border.*

No examination of the heart is complete in ruling out aortic regurgitation unless the patient has been examined either sitting or standing leaning well forward, in deep expiration, and with the diaphragm or Bowles' best piece (fig. 2). The diastolic murmur of rheumatic aortic regurgitation is best heard along the left sternal border or at

WHITE, F. D. *Heart Disease*. 2d edition. The Macmillan Co. New York, N. Y. 1941. 8.

22. ALLEN, W. M. M., FINE, M. B. and SPENCER, H. B. Variation in the first pulmonic sound stimulating by an isolated presystolic murmur of mitral stenosis: phonocardiographic study. *New England J. Med.* 621: 634 Oct. 27, 1919.

the apex and not in the right second interspace. It is not necessary to demonstrate an enlarged left ventricle, a Corrigan's pulse, a wide pulse pressure, or an abnormal electrocardiogram (EKG) to diagnose aortic regurgitation. It is necessary only to hear its characteristic diastolic murmur occurring immediately after the second heart sound.

Since Mackenzie's day a common belief has been that a systolic murmur occurring in a heart of normal size, and in a patient without symptoms of myocardial insufficiency may be disregarded.<sup>24-26</sup> Nothing is farther from the truth when the aim is the detection of heart disease before it has resulted in failure or subacute bacterial endocarditis. Interpretation of the systolic murmur at the apex is usually a difficult problem. It is here that Army experience has taught us the great value of Levine's classification of murmurs, according to intensity. Examinees with a Grade III or louder systolic apical murmur are rejected for military service regardless of the absence of other evidence of heart disease. In the young such a murmur usually signifies rheumatic mitral valve disease, and in the older age groups, left ventricular enlargement.

The difficult problem is the Grade I or II apical systolic murmur. We reject examinees with Grade II murmurs unless the murmur is completely dispelled in certain phases of respiration and all persons with Grade II murmurs and an authenticated history of rheumatic fever or other sign of heart disease. Grade I or II systolic murmurs may result from fever, anemia, tachycardia, hypertension, hyperthyroidism, nervous excitement or neurocirculatory asthenia. An other factor occasionally encountered is chest deformity such as funnel breast or flat thorax. These factors are diagnostically important because if they can be eliminated a Grade I or II murmur may indicate organic heart disease. One important precaution in the evaluation of a Grade I or II apical systolic murmur is to be sure it is not merely a murmur transmitted from the pulmonic area. The site of maximum intensity must be at or near the apex. If an examinee with a Grade I apical systolic murmur has an authenticated history of rheumatic fever we reject him. If there is no history of rheumatic fever or other evidence of heart disease we accept him. In borderline cases in which there is a doubtful or unauthenticated history of rheumatic fever the extracardiac factors previously mentioned should always be looked for.

<sup>24</sup> 1st T. The healthy Heart and its Effect on Disease. Paul H. Hunter, New York, N. Y. 1921. 1st ed.

<sup>25</sup> 31 J. Measures of the Heart and its Relation to Disease and Health and to the Heart. 1928. p. 82.

<sup>26</sup> 16 U. Cardiac signs in young adults with special reference to the diagnosis of rheumatic fever. 1929. p. 104.



Life insurance reports illuminate the significance of the apical systolic murmur.<sup>27, 28</sup> Considering normal mortality as 100 percent they show that an inconstant murmur gives a mortality of 111 percent, while a constant murmur gives a mortality of 193 percent. A constant apical systolic murmur loud enough to be transmitted to the left has a mortality of 282 percent. These figures are in hearts normal in size. If there is slight hypertrophy the mortality is 330 percent and if moderate hypertrophy it is 609 percent. A constant systolic apical murmur plus a history of rheumatic fever gives a mortality of 453 percent in persons without cardiac hypertrophy.

It is advisable to reject examinees with rheumatic heart disease even though their hearts are well compensated and of normal size because (1) with extreme physical or mental exertion they may develop arrhythmia, dilatation and failure (2) their rheumatic fever may recur (3) subacute bacterial endocarditis is a constant threat and (4) they may become a Government charge. It is a serious error to accept a person for military service who has organic heart disease. It is also a serious error to diagnose organic heart disease when it is not present. In the latter case the Government loses a man's service and the man may develop a cardiac neurosis for which cure is difficult.

Physiologic systolic murmurs found at the apex do not indicate organic heart disease and are not a cause for rejection. They can be heard in from 12 to 44 percent of all persons examined.<sup>29-32</sup> If the apex is listened to after exercise this is increased to over 80 percent.<sup>33</sup> Some of the characteristics of the physiologic systolic apical murmur follow:

1. It is neither loud nor harsh. It is Grade I or II in intensity. It is not loud enough to be heard in the axilla or left base except in a very thin-chested person.<sup>34</sup> Usually it is heard only over a limited area. Frequently it is maximal medial to the apex, even halfway to the sternum.

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2. It is short and does not occupy the entire period of systole. Often it begins following a distinct interval after the mitral first sound<sup>23 26</sup> It never obscures nor replaces this sound. Usually it terminates before the mitral second sound. This murmur remains short in duration whether the heart rate is slow or rapid, which is not the case with pathologic murmurs which become longer in duration when the heart rate slows.

3. Its intensity is often affected by a change in position, breathing or heart rate. Usually it is loudest with the patient recumbent and may disappear when he is upright. Its intensity may vary with certain phases of respiration. It may disappear with inspiration. It may be of decreased intensity with tachycardia, the reverse of murmurs of organic heart disease.

4. Its mechanism is unknown.<sup>27</sup> It is not considered as a diagnosis unless the heart is normal in size and the blood pressure is normal.

An innocent cardiorespiratory murmur is often heard at the apex in the axilla or near the angle of the left scapula, and is caused by the heart's action on the adjacent lung causing air either to enter or leave and resulting in a respiratory murmur. By careful attention to the effect of different phases of respiration, this murmur can be diagnosed. It is usually present only during inspiration and is systolic in tone. Occasionally it is diastolic and may be heard in expiration.

The pulmonic area has been called the "area of auscultatory romance." Many murmurs occur here<sup>28</sup> but structural disease of the pulmonary valves is rare. Here a murmur can be disregarded if it is Grade I or II in intensity and if there is no other sign of heart disease. Although all loud murmurs were in their beginning only Grades I and II, murmurs of such intensity are so common in the pulmonic area that they must be disregarded unless the patient can be followed for months or years. With full expiration this physiologic murmur may reach Grade III in intensity but it often disappears on full inspiration.

The more common important organic cardiac diseases that may cause a pulmonic systolic murmur of Grade III or louder include

1. *Patent ductus arteriosus*—Here the systolic murmur is loud and there is, in addition, a diastolic murmur. The two murmurs result in a continuous murmur. Typically there is no interval of quiet

<sup>23</sup>E. W. Hilal: Systolic murmurs. Brit. M. J. 1 9 J. N., 1943

<sup>26</sup>F. A. W. Loomis: Heart murmurs. Brit. Heart J. 9 1 17 J. N., 1947 and 9 J. 4 Oct 1947

<sup>27</sup>H. E. T. Loomis: Breathing. Lancet 2 724-726 Sept. 10 1950

<sup>28</sup>M. J. R. Trigonoblation of mitral ear. Lives and its relationship to certain heart murmurs. Am. Heart J. 12 702-703, Mar. 1937

The systolic murmur is often crescendo to the second sound and the diastolic component is decrescendo from the second sound. This results in a triangulation of the continuous murmur with maximum loudness with the second heart sound.

2. *Interatrial septal defect*.—To diagnose this lesion without the aid of cardiac catheterization, increased pulmonary blood flow must also be demonstrated by roentgenogram or fluoroscopy of the chest. Right bundle branch block in the EKG is of diagnostic value.

3. *Isolated pulmonic stenosis*.—Since cardiac catheterization has become a means of studying cardiac disease, this lesion has been found to be fairly common, especially in the lesser grades.<sup>26-28</sup>

4. *High intercentricular septal defect*.—The diagnosis of this lesion without the presence of a thrill is apt to be in error. More commonly this murmur is heard lower down along the left sternal border in the third and fourth interspaces.

We work on a basis that candidates with a persistent systolic pulmonic murmur of Grade III or more should be rejected. The insurance companies report that there is only a 12 percent increase in mortality above general expectation in those with pulmonic systolic murmurs of all grades.<sup>27-29</sup>

In the aortic area the problem is simpler in the young age group. We reject for military service those with a *localized* systolic murmur of any intensity (unless Grade I). It is important to make sure that the murmur is not merely transmitted from the pulmonic area. Its maximum intensity must be in the right second interspace. In the older age groups the problem is more complex and we accept an examinee with a Grade I murmur because the underlying slight dilatation of the aorta is common and is not a cause for rejection. In young adults a soft Grade I murmur in the aortic area may be caused by emotional tachycardia or hypertension resulting from the nervousness and excitement of being examined.<sup>30</sup> This can only be diagnosed by repeating the examination after the examinee has calmed down. This type of murmur is not a cause for rejection.

<sup>26</sup> GREENE, D. G., B. LOW, E. DUFF, BALDWIN, J. E.; H. H. MELESTER, A. ROW, C. E. and COOPER, W. A. Pure congenital pulmonary stenosis and idiopathic congenital dilatation of the pulmonary artery. *Am. J. Med.* 24-40 Jan. 1948.

PULLACE, A. A., T. FLORE, B. D. OWEN, D. M. and B. SCHULZ, H. B. Symposium on cardiac catheterization: pulmonary stenosis without septal defect. *Proc. S. of Meet., Mayo Clin.* 22: 816-829 Oct. 27, 1948.

DOW, J. W., LA. VE, H. D., ELK, M., HA, EN, F. W., JELLY, R., H. K., W. FLETCHER, J. W., FRYER, B. G., GOODMAN, W. T., HARR, W. P., EPPINGER, H. C.; and DEXTER, L. Studies of congenital heart disease: uncomplicated pulmonic stenosis. *Circulation* 267: 237 Feb. 1949.

HARRIS, T. W. Cardiology criteria for diagnosis of rheumatic heart disease in post-war study subject. *Ann. Int. Med.* 24: 334-346 Apr. 1947.

Auscultation along the left sternal border is especially important in the detection of aortic regurgitation and interventricular septal defect. We reject examinees with a localized systolic murmur of Grade II plus or greater unless the murmur is dispelled by full inspiration.

#### SUMMARY

Figure 3 shows the grades of intensity of systolic murmurs which we consider to be a cause for rejection. The rings designate the area where the murmur is heard with maximum intensity. The position of the patient and the proper stethoscopic chest piece are important aids in detecting the faint diastolic murmurs of mitral stenosis and aortic regurgitation in patients without enlarged hearts. In evaluating

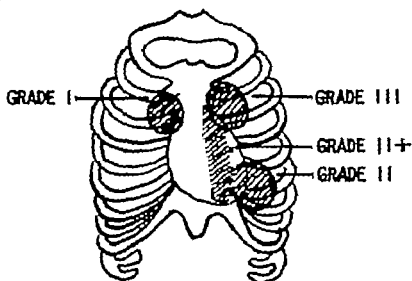


Figure 3.—Diagram showing the area of maximum audibility and the degree of intensity of systolic murmurs that should arouse suspicion of heart disease.

systolic murmurs the accurate localization of maximum intensity classification of murmurs according to intensity and the duration of the murmur are important. A satisfactory working rule is to consider as pathologic until proved otherwise any of the following systolic murmurs: Grade I aortic, Grade II apical, Grade II plus parasternal and Grade III pulmonary.

#### DISCUSSION

JOHN G. KRAUS, U. S. Army Medical Corps

The sound and murmurs produced by the human heart lie in and below the lower range of human audibility. It requires therefore but very slight impediments in any given case to result in partial or complete or distorted audition of the sounds present. Although investigators have long recognized that the ear is not an ideal modality

for the detection, recognition, and analysis of sounds, it is still possible to improve the power of the auscultation by practice, education, and the use of proper instrument for auscultation. Examination should be conducted in a quiet room, but it is not always possible to secure a quiet room and, indeed, oftentimes successful diagnoses have been made even in the presence of considerable noise. It is important to differentiate significant heart murmurs but before that can be accomplished it is first necessary to hear the murmurs and to hear them well. Ear pieces for stethoscopes are available in 20 or more sizes. Different shapes can also be obtained. It is thus possible to have a fitting of ear pieces so snug as to eliminate practically all outside noises, and so comfortable as to enable one to use the stethoscope for many consecutive hours without discomfort.

The acoustics of the two common types of chest pieces vary greatly. Many can hear clearly with one kind of bell and not with another. Various types of diaphragm scopes differ even more greatly as to their acoustic properties. If a diaphragm type is used, care should be exercised to see that there is not a bulging, concave, or cracked part. Otherwise many noises will be heard that cannot be attributed to the heart. The rubber or plastic tube of the stethoscope should be substantially thick, new, and elastic, neither too flexible nor too rigid. Stethophones and other amplifying devices are necessary only for examiners who have defective hearing. If such devices are used, it is necessary to exercise even more care than with the ordinary stethoscope to avoid errors because of the introduction of extraneous sounds.

Whatever auscultatory device you may use to assist in examining for heart murmurs, it is important to know that there are many murmurs that cannot be heard at all or at least not clearly unless the examiner moves his head up and down during the examination. A position can thus be found which is the best position for the auscultation of any given murmur. The best way to miss hearing certain physiologic murmurs is to neglect this simple procedure. In induction examinations there are often many circumstances in which a physiologic third heart sound is confused with a low-pitched diastolic murmur. In such instances, if there should be any doubt as to which of the two is present, the inductee should be examined in a recumbent position with his lower extremities elevated. This maneuver will automatically increase the intensity of a physiologic third heart sound. Muscle twitching in many nervous people tends to interfere with the true heart sounds and may even simulate murmurs. The person being examined should hold his breath in midexpiration and relax his shoulders. This usually relaxes him and the muscle twitching ceases.

If the ribs are prominent and the chest wall thin, the interspaces are often deep or retracted. When this is true whether you are using a bell or a diaphragm chest piece the apex beat may slap the chest piece with each systole thus giving rise to vibrations often mistaken for a cardiac murmur but more frequently mistaken for a friction rub. When the cause is understood and looked for jumping to erroneous conclusions in such instances can be avoided. Split first and second sounds are commonly heard in normal hearts but are frequently mistaken for murmurs. Split sounds are always close together. Split first sounds are commonly misinterpreted as presystolic murmurs. They must be carefully differentiated. The pitch of a split sound is almost invariably much higher than the pitch of a presystolic murmur. The duration is shorter and the quality is totally different—it is more metallic. Split second sounds are more frequent in the presence of heart disease but may still occur in normal people. The presence of a split second sound should prompt us to look for real murmurs. The use of exercise or a whiff of amyl nitrite together with examination in the left lateral recumbent position often facilitates the detection of such murmurs.

The inclining technic is useful for the purpose of timing diastolic murmurs. This technic consists simply of rhythmically changing the position of the stethoscope from base to apex or from apex to base. At the base the second heart sound is usually loud, clear and of a distinctive quality. By noting the rhythm the second sound can thus be positively identified all the way down to the apex. Any murmur following it is a diastolic murmur.

The venous hum often mistaken for a heart murmur is rarely heard except in children. It does occur however in adults and especially in thin-chested ones. Although the hum is generally heard only in the neck, it is sometimes heard over the entire chest or portion of it. There is a certain quality which to the initiated examiner usually distinguishes a venous hum from a cardiac murmur but if there is any doubt the hum can be eliminated by exercising light pressure at the upper part of the jugular vein. True murmurs cannot be eliminated or modified by this maneuver.

High pitched murmurs are heard best by the use of a diaphragm type of chest piece. The bell is generally preferred for the low pitched murmurs. That is why both types of chest pieces should be available. Along with the detection and evaluation of murmurs it is necessary to consider the characteristics of the first and second heart sound. If the heart is normal both sounds are proportionately increased after exercise, inhalation of amyl nitrite or similar maneuvers and both sounds are proportionately decreased in a recumbent

position. Any change of relative intensity of either heart sound contrasted with the other is important and may signify the presence of a cardiac lesion. When such a finding is made in the presence of a doubtful murmur the need for reexamination and study of the inductee is indicated.



# The Ballistocardiograph in Clinical Medicine

HAROLD A. LYON, Commander MC USN

WILLIAM HARVEY started an unending series of studies of the circulation in 1628 with his epic, "Concerning the Motion of the Heart and Blood." From these studies various types of apparatus have been devised to penetrate the secrets of the circulation and the heart e. g., the pulse recorder, electrocardiograph, plethysmograph, cardiograph, stethocardiograph, the cardiac catheter and the electrokymograph. All these are used to study the heart or the pressure produced by its systole in health and disease. The ballistocardiograph records the motion imparted to the body by blood leaving or entering the heart but not its pressure. It is an ingenious device first used in 1877<sup>1</sup> but greatly improved by Starr<sup>2</sup> who used a bed suspended by wires from the ceiling its motion damped by a spring. The movement imparted to the body by the rush of the blood is not detected on physical examination except in patients with aortic regurgitation. When we stand on a spring scale the motion is apparent as a jiggle synchronous with the pulse. The mechanical principle involved is found in Newton's Laws of Motion. Simply stated, to every reaction there is an opposite and equal reaction. When blood leaves the heart or impinges on the wall of vessel it exerts forces which move the body. This has recently been described by Starr<sup>3</sup>

Department of Research in Medicine, U. S. Naval Hospital, St. Albans, Long Island, N. Y.

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2. T. R. 1880, A. J. J. R. 1880, H. A. and J. 1880, R. L. Studies on estimation of the motion of the human body in relation to function from heart recoil and the ballistocardiograph. *Am. J. Physiol.* 127: 1-10, 1930.

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5. A. J. J. R. 1880, H. A. and J. 1880, R. L. Standardization of ballistocardiograph by taking of heart function (bearing with blood) method of motion of cardiac strength and normal standards for it. *Circulation* 1: 1-10, 1946.



The apparatus of Starr is the classical ballistocardiograph used in many institutions. Some of the modifications<sup>10</sup> of this apparatus with their recording devices have made elaborate installations necessary for the bed and for the recording equipment, and some require an electrophysicist to keep them in operation. Dock and his collaborators<sup>11, 12</sup> have described technics for obtaining records directly from the body at rest on any solid bed or table, thus making ballistocardiography available to the practicing physician. I have used these technics and have been associated with Dock in their development. The ballistocardiograph in this form requires no special skill for operation and can be constructed easily by anyone with the interest and desire to have a ballistocardiograph. After procurement of the several parts, the instrument can be constructed in several hours, using a knife, a screwdriver and a soldering iron. The recordings with such instruments are essentially the same as those made with Starr's apparatus on the same patients.

#### THE APPARATUS

The first apparatus developed consisted of an ordinary pulse capsule applied to the vertex of the head with a counterweight. Although the recorded waves are of a fair quality head tremors and kyphotic spines cause bizarre records. A better technic is to take recordings from the shins by the use of a photoelectric cell (figs. 1, 2, 3, and 4) or to record the velocity of the motion of the body by the use of a coil and a magnet, the coil being fixed to the shins and the magnet to the table, so that the movement of the body induces a current in the coil (figs. 5, 4, 3, and 6). The dry cells and the electrical connections are placed inside the balsa blocks of which the apparatus is constructed. In the photoelectric cell type the light beams are interrupted on the photocell by a screen. In the electromagnetic type the magnet is fixed by the stand on the table. The coil is mounted in or on the balsa wood. The electromagnetic and the barium titanate piezoelectric method (not yet described ballistocardiograph)<sup>13</sup> are the simplest

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- BRIDGES, W. and TAYLOR, H. J. Practical clinical application of new piezoelectric material ballistocardiograph. *Bull. N. Y. Acad. Med.* 25: 267, 1949.

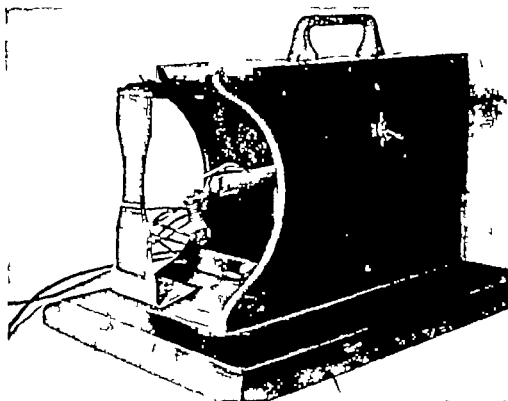


Figure 1.—The photoelectric cell ballistocardiograph showing the various features of the instrument



Figure 2.—The method in which the photoelectric cell type ballistocardiograph is operated

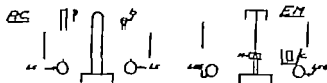
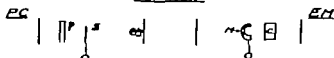
END VIEWTOP VIEW

Figure 3.—Diagram of the end view and top view of the photoelectric cell type (PC) of the apparatus and the electromagnetic type (EM) (p) Photocell, (b) 3-cell (2-cell) bulb, (m) magnet, (c) coil, and (s) screen for the photoelectric cell.

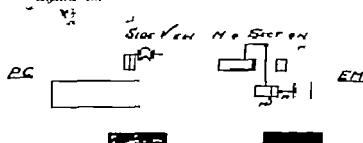


Figure 4.—Side-view diagram of the photoelectric cell type and the electromagnetic type apparatus.

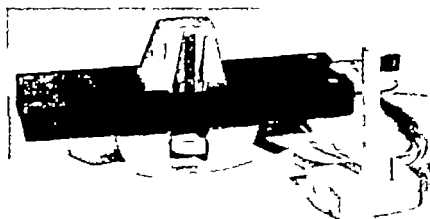


Figure 5.—The electromagnetic type of ballistocardiograph with the stand containing the point for fixing the magnet at the dot on the magnet.



Figure 6.—The electromagnetic type of ballistocardiograph in operation.

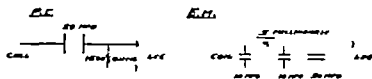


Figure 7.—Wiring diagram of the photoelectric cell and the electromagnetic ballistocardiographs. The 1,500 ohms resistor in the PC type is used only when recording on an amplifying recorder. The microfarad capacitors in the EM type are used only when recording on a string type galvanometer.

and are easily adaptable to all types of recording apparatus, whether a string beam, or direct writing galvanometer or an oscilloscope. Many other arrangements of the electromagnetic and photoelectric cell have been obvious but the simplest have the elements mounted on 10-inch balsa blocks which are placed across the shins, while a base between the legs either fixes the magnet mounted on a hinge, or casts its shadow on the photoelectric cell (figs. 3, 4, 5, 6, and 7). The photoelectric cell apparatus produces a record purely by displacement whereas the magnet type records the velocity of the body movements. The latter is more informative in degenerative heart disease, the former in coarctation and peripheral shock. The tracings illustrated in this article have all been made with one of the types of ballistocardiographs described in the foregoing. All tracings are accurately reproducible, and records can be identified as belonging to a particular person because each of us has a ballistic tracing as characteristic as our profiles.

#### THE NORMAL BALLISTOCARDIOGRAM

The footward and headward movements of the body are recorded respectively as downward and upward deflections of the tracing (fig. 8). Using Starr's original designations of the waves, the first wave is an H wave which is considered to be caused partly by auricular systole and by the apex thrust of the heart. The next wave is the downward I wave which is caused by the recoil from ventricular ejection of blood. This is followed by the upward J wave which is caused by the impact of blood flow on the aortic arch and pulmonary bifurcation. The downward K wave which follows is caused by deceleration of the blood in the descending aorta and impact on its bifurcation. This is followed by a series of waves caused by after vibrations or return flow into the ventricles in diastole. They are

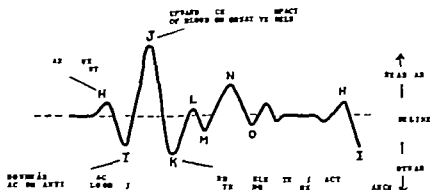


Figure 8.—Drawing of the normal ballistocardiographic wave pattern with a brief explanation of the most significant waves.

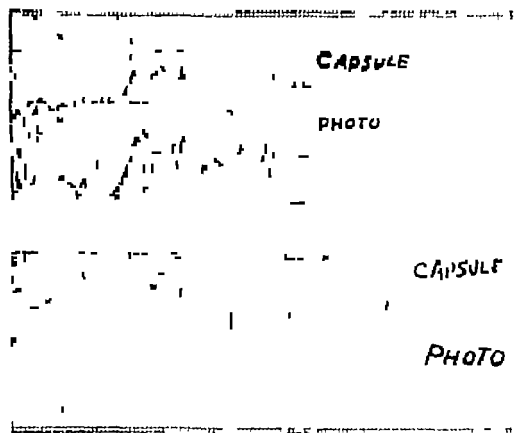
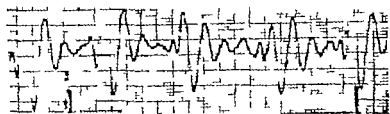
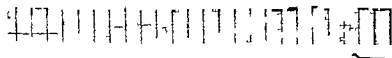


Figure 9—Normal ballistocardiograms recorded simultaneously using the capsule and the photoelectric cell method



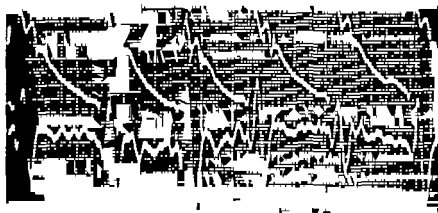


Figure 11.—Normal ballistocardiogram with simultaneous carotid artery pulse (photoelectric)

lettered successively L, M, \ O. Records obtained with this apparatus have been of value in diagnosis, prognosis, and management. There are minor variations in normal ballistocardiograms as there are in normal electrocardiograms, but fundamentally they do not vary greatly. A series of normal ballistocardiograms of different persons are shown (figs. 9, 10, and 11).

The various waves are easily identified. A correlation of the various mechanical effects of the cardiac cycle can be recorded simultaneously (fig. 12).

#### ABNORMAL FORMS

The abnormal ballistocardiogram reveals itself in either (1) a pronounced variation with the respiratory cycle or (2) a low or high amplitude (3) notched J waves, (4) deep or absent h waves, (5) poor definition of the complexes or a mere jumble of oscillations, or (6) a combination of the variations. With some mitral lesions or gallop rhythm, large diastolic waves, exceeding the I J h, may be encountered. Examples are shown in figures 13 and 14. Many patients with angina pectoris or asymptomatic healed in-

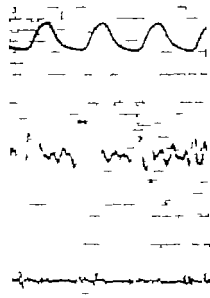


Figure 12.—Simultaneous record of normal electrocardiogram, ballistocardiogram, and closthermogram.

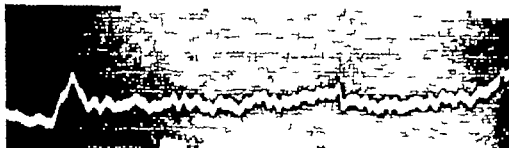


Figure 13—Ballistocardiogram of a patient with extensive infarction of the anterior myocardial wall (photoelectric)

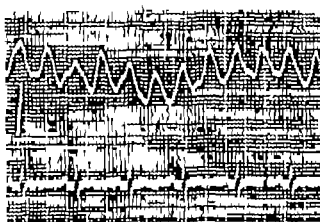


Figure 14—Ballistocardiogram showing the undulatory type of pattern in a patient with pericardial effusion

which there is lowered amplitude poor definition or both occurring in the expiratory phase of the respiratory cycle. Brown has classified this into groups, depending on the degree of change. He has pointed out the rough correlation between the degree of change and the severity of the disease process. The presence of this pattern is a valuable aid in the diagnosis of coronary disease and may be the only evidence of such when electrocardiograms and exercise tests reveal no abnormalities. The pattern may be improved by abdominal binders and about 25 percent of patients with angina pectoris can be relieved of their symptoms, provided a special abdominal corset convert the abnormal ballistocardiogram to a normal or more normal tracing. A record is made with the patient recumbent and not upright. We have 12 patients who have benefited by the corset with an increase in exercise tolerance and no further need for nitroglycerin.



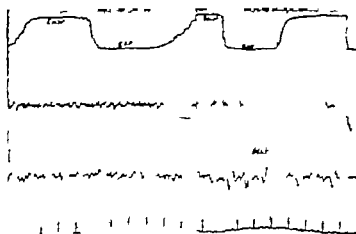


Figure 15.—Ballistocardiogram showing the effect of an abdominal belt on patient with angina. The expiration is also recorded.

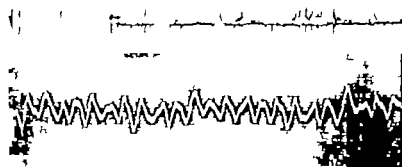


Figure 16.—Ballistocardiogram in a patient with auricular fibrillation, with simultaneously recorded heart sound. Note the bizarre pattern and greater amplitude as recorded with fonendoscope.

(fig 1) Some patients with intractable angina have been spared sympathectomy by the use of the corset. Brown<sup>14</sup> has evidence obtained by catheterization studies in animals that increased venous return to the heart is the probable explanation for the improvement. Our own limited experience has demonstrated that in humans the right atrial pressure can be raised by the abdominal corset.

14. Brown, W. Pericardial pressure and flow.  
 15. Brown, W. J. Corset corset. J. Surg. 1950.

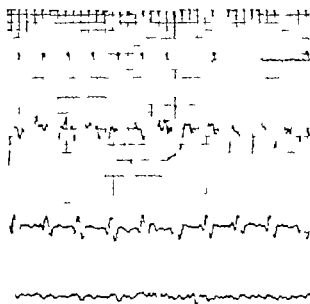


Figure 17.—Comparison of ballistocardiogram of patient with aortic insufficiency, normal person and patient with advanced coronary disease (reading from top to bottom)

The arrhythmias show bizarre patterns that can be well correlated with the abnormal physiologic findings (fig. 16). Patients with aortic insufficiency, anemia, beriberi, hepatic cirrhosis, and hyperthyroidism show large amplitude of the waves (fig. 17). Those with dilatation of the aorta show a characteristic shortening of the K

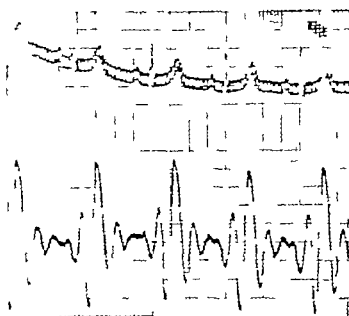


Figure 18.—Typical ballistocardiogram of patient with dilatation of the aorta. Note the short K wave.

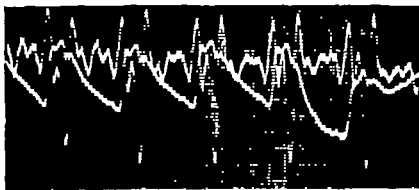


Figure 19.—Ballistocardiogram of hypertensive patient showing the deep K wave and the notched J wave (early myocardial involvement).

wave (fig. 18). A short h wave believed to be caused by splanchnic vasoconstriction may be present in patients with severe hypotensive states such as shock. In fact this may allow a diagnosis of shock to be made earlier than by any other methods. A deep K wave characterizes the pattern seen in patients with hypertension or aortic rigidity. Hypertensive patients with early myocardial involvement show in addition a notched J wave (fig. 10). A deep K wave caused by the arteriovenous shunt of the placenta is seen in pregnant women; this disappears within 3 days after delivery. Large waves occurring in diastole are gallop waves or are caused by the high velocity of the narrow stream through a stenotic mitral valve (fig. 20).

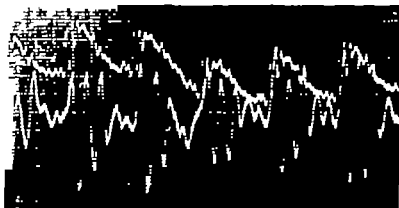


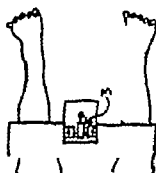
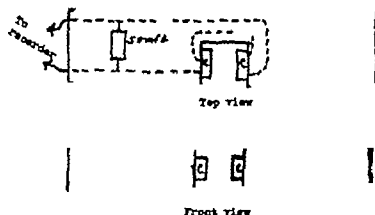
Figure 20.—Ballistocardiogram of patient with aortic insufficiency in which large gallop waves are present in diastole.

# PROGNOSTIC VALUE

The ballistocardiogram is of prognostic value clinically. A more accurate prognosis can be given in a case of myocardial infarction in which the ballistocardiogram returns to normal after the episode than in a case in which it remains abnormal. The same may be said

## BALLISTOCARDIOGRAPH

### The crosspiece



In use

Figure 21.—Diagram of the slight change in construction of the ballistocardiograph employing two coils (C) and a flat magnet (M). The magnet is fastened to a stand whereas its crosspiece goes across the shins. The crosspiece is shown from the top and front views. The crosspiece and the magnet are shown in operating position.

regarding such conditions as pericardial effusion, hypertension and others. The change in the K wave in patients after operation for aneurysm of the aorta may indicate the success of the operation. An abnormal ballistocardiogram may indicate coronary artery disease.

before any signs or symptoms appear.<sup>14,17</sup> The ballistocardiograph could in this way be of value in screening military personnel. Brown<sup>18</sup> has shown that cold will produce ballistocardiographic changes and make abnormal ballistocardiograms even worse.

*Addendum*—Since this article was submitted for publication the electromagnetic type of ballistocardiograph has been modified. This is shown in figure 21 in which two coils (C) are employed with a flat magnet (M) mounted on a stand. The coils are wired so that the currents are additive. This allows ignoring exact centering of the magnet. The principle however is the same as in the electromagnetic instrument illustrated in the foregoing diagrams.

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FRANK, I. and WOOD, F. C. — Studies with ballistocardiograph in acute cardiac infarction and chronic coronary artery disease. *Am Heart J* 25: 1-141 Jan 1943

(1) 478, R. (Personal communication)

FRANK, I. R. J. and FRANK, R. — Seasonal fluctuations in heart and coronary disease as related to changes in instrumental factors. *Am Heart J* 25: 765-769 May 1943



# A New Pickup for Ballistocardiography

44-38861-1 RILEY, J. R. V. D.

Feb. 11, 1908. M. E.

AUGUST 1 DEPARTURE V. E. E.

G L N N H WATT

THE value of ballistocardiograms which have been described as the records of the heart recoil and the blood's impacts, has only recently been realized by the medical profession. Although the pioneer work of Starr et al.<sup>1</sup> and the later effort of Hamilton et al.<sup>2</sup> Nicholson<sup>3</sup> and Brown et al.<sup>4</sup> has brought to light the diagnostic and prognostic qualities of these tracings, the equipment required has been of such size and expense as to discourage any but the research worker from using it. Recently Dock,<sup>5</sup> has brought this type of recording within the reach of anyone who has an electrocardiograph. By the use of simple ingenious techniques, using in one instance a photocell and in another a magnet and coil, he has been able to record ballistocardiograms directly from the body. This will open a new field to the cardiologist and general practitioner as well, because the information derived from a ballistocardiograph is unobtainable by

results in the epidemiology of HB virus. *Journal of Infectious Diseases* 1994; 169: 1011-1014.

Electrical engineer: Naval Corps Engineering Laboratories, Fort Monmouth, N. J.

6. **Grade Engineer**

At age 1 and 2 years, 2 of 4 children had normal (adequate, low-normal) results of tests of function of heart and circulation in the lungs (Table 1). In 1 of 2 children 19; 457 and 20; 194

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*J. Physiol.* 1945, 100, 370-386

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1. I am not a KKK member. I know nothing for recording bill towards any directly from the 1st of May 1948 to 1st of May 1949.

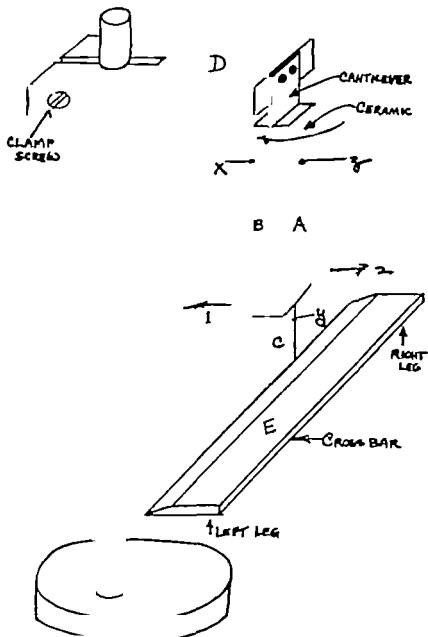


Figure 1.—Schematic diagram of pickup unit for ballistocardiography

any other device or diagnostic aid. When these instruments are used, heart disease may be demonstrated in patients with angina and normal electrocardiograms and the work of Starr has shown its value in the asymptomatic patient. The frequent failure of the electrocardiograph to demonstrate coronary heart disease is well known, but the ballistocardiograph decreases the percent of patients with negative objective evidence.

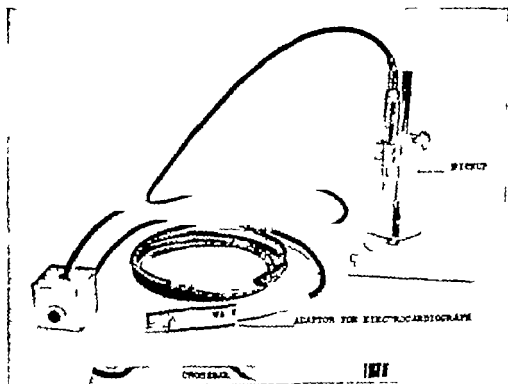


Figure 2.—Ballistocardiograph with shielded cable and adaptor for electrocardiograph.

While working with the photocell device we sought to set up a wire elastic strain gage in its place. Further investigation produced the instrument which we wish to present here. We found that a pickup device using a piezoelectric system gave optimum results and was eminently successful in recording ballistocardiograms directly from the body. The pickup unit is a self generating device using a glennite piezoelectric ceramic element (figs. 1, 2, 3, and 4). A piezoelectric material is, by its nature, one which when it receives a mechanical strain becomes electrically charged, and, hence, generates an electric potential. In this unit piezoelectric plates A and B are mounted on a hole of the metal strip C, which is held cantilever fashion to the



base D. The patient lies supine on the table and the crosspiece E is placed across the patient's bare legs and against the bottom of cantilever C, bearing a light pressure against the latter.

The heart's recoil and the blood impact cause headward and footward displacement of the legs. When the patient's legs have a footward displacement, the cantilever is bent in direction "1" shown in the sketch. Element 1 is then put in tension and B is put in compression. These elements are so mounted that this causes positive voltage to be induced from  $x$  to  $y$  and from  $y$  to  $z$ . Hence the voltages

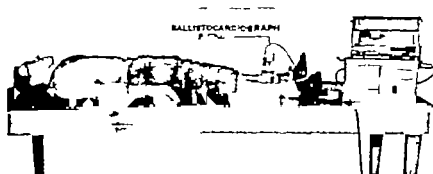


Figure 3—Ballistocardiograph in use.

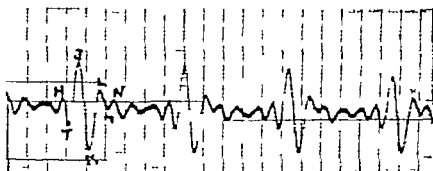


Figure 4—Normal ballistocardiographic record obtained with new pickup

are additive. Similarly when the legs have a headward displacement a voltage of the opposite polarity is induced and the cantilever is bent in direction "2". These voltages are then fed through proper electric network including amplifier and may then be recorded on any standard recorder. With this arrangement the magnitude of the needle displacement on the recorder is a measure of the displacement of the leg of the patient. Should one wish to have the recorder indicate the height of leg displacement it is possible to introduce relative amplification network which will make this conversion.

## DISCUSSION

From our experience the photocell device has been unsatisfactory because of difficulties with both the light source and the friction in the hinge. The magnet and coil device described by Dock measures velocity and there is some question yet as to whether the graph of velocity or of displacement will be of more clinical value. The present device measures displacement and by using the proper electric circuits, velocity or acceleration can be obtained. The electric output obtained from this new pickup element is 20 times that of the output obtained from a magnetic device; therefore ample voltage is available to operate any cardiograph or recorder without additional amplification. The excess voltage also makes it possible to use electric integrating or differentiating circuits to reveal hidden characteristics not easily recognizable in the original record. The records derived from this pickup are consistently reproducible and obviate the need of frequent standardizations.

## SUMMARY

Technics for recording ballistocardiograms directly from the body have recently been reported. A new pickup using a piezoelectric element is herein described. The electric output of the pickup is of such magnitude that various other circuits to record velocity or acceleration can be inserted without the need for amplification.





# Long-Acting Heparin Preparation A Useful Adjunct in Anticoagulant Therapy

## A Clinical Trial of Depo-heparin Sodium in 15 Cases<sup>1</sup>

WILLIAM J. SMILES, *Lieutenant j. nio grade MC U S N R*

A LONG ACTING form of heparin, depo-heparin sodium<sup>2</sup> was tested on the Cardiovascular Service U S Naval Hospital Bethesda Md., to ascertain its effectiveness and practicability as an anticoagulant and its usefulness as an adjunct to dicumarol in treating thrombo-embolic disease.

### BREAKDOWN OF CASES

The drug was used in 15 consecutive patients in whom anticoagulant therapy seemed indicated. Nine were patients with coronary artery disease suspected of acute myocardial infarctions. 5 of these subsequently proved to have fresh infarcts, the other 4 had anginal attacks with severe transient myocardial ischemia. Five patients whose data went into this study had acute thrombophlebitis of the leg veins. Three of these had such extensive involvement as to be considered serious, one having already sustained a pulmonary embolism while two who had more localized thrombophlebitis had shown some objective signs of extension prior to treatment. One patient suffered from an extensive deep thrombophlebitis. Prior to anticoagulant therapy, he developed an acute myocardial infarction, and was promptly treated with heparin and dicumarol.

1. R. N. 1 Hospit. L. N. 10001 N. 1 Med. Dept. Center Bethesda, Md.

R. pulled in 1 cc. cartridges with disposable syringe. Each cc. contains

Heparin sodium (100,000 unit) \_\_\_\_\_

Gelatin \_\_\_\_\_

Dextrose \_\_\_\_\_

400 mg.

150 mg.

24 mg.

Preserved with sodium thymocetyl thioacetate 1:10,000

## METHOD

The following routine was carried out as closely as possible: (1) An initial prothrombin time on both dilute and whole plasma was obtained. (2) A coagulation time by a modified Lee-White technic was determined. I did this personally in order to maintain standard procedure. (3) An initial dose of depo-heparin without vasoconstrictors was injected into the deep subcutaneous tissues, usually the anterior aspect of the thigh, and the area was marked. (4) In the absence of other factors such as chronic heart failure, extreme debility and cachexia, known liver disease, blood dyscrasia or anticoagulant therapy prior to admission, dosages were based on weight. Patients who weighed from 100 to 150 lb. received an initial dose of 200 mg. (1 cc). Those who weighed over 150 lb. were given 400 mg. (2 cc). (5) In the next 24 hours the coagulation time was determined twice. (6) At the end of 24 hours a second prothrombin time was obtained. (7) Near the end of the first 24 hours a second dose of depo-heparin was injected in the opposite thigh and the site of the first injection was observed and palpated. The second dose of depo-heparin was either 200 or 300 mg., depending on the coagulation time near the end of the first 24 hours. (8) The patient was then started on dicumarol according to our usual schedule of 200 mg. the first, 200 mg. the second, and 100 mg. the third day. (9) On the second day of dicumarol therapy a third dose of depo-heparin was given, again determined by the coagulation time; usually 200 mg. was sufficient. (10) As was anticipated, by the third day of dicumarol administration, the increase in prothrombin time had reached a satisfactory level of about twice normal, and if the coagulation time was then lengthened 2 or 3 times, no more depo-heparin was administered. The patient thereafter was maintained on a daily dose of dicumarol. (11) The results were carefully noted. (12) An autopsy was performed on the one patient who died with special attention to any evidence of subintimal rupture, hemorrhage as well as signs of complications of a thrombo-embolic nature.

## RESULTS

The data was analyzed for: (1) the effect of depo-heparin on the coagulation time; (2) the apparent effect of depo-heparin on the prothrombin time during the first 24 hours with special reference to the dilute (1:4) plasma; (3) untoward reactions, local or systemic; and (4) clinical and autopsy results.

*Effect on coagulation time.*—In each patient a substantial and satisfactory increase in the coagulation time was observed following the initial dose of 200 or 400 mg. of the drug. One patient who received 200 mg. failed to show an adequate response.

*Case report*—In a preliminary trial one patient a 67 year-old, 170-pound white man, had previously been somewhat sensitive to dicumarol. He received penicillin in oil and digitalis. In addition he had a massive thrombophlebitis, as well as a fresh myocardial infarction. He received 200 mg of depo-heparin and simultaneously dicumarol therapy was restarted. He failed to show any significant response to the depo-heparin. This lack of effect on the coagulation time may have been because the initial dose was too small. The penicillin, the combined extensive thrombosis and the shocklike impairment of the patient's circulation all might have contributed to prevent a satisfactory anticoagulant effect. After 18 hours, a second dose was given with good results. This patient made a satisfactory recovery.

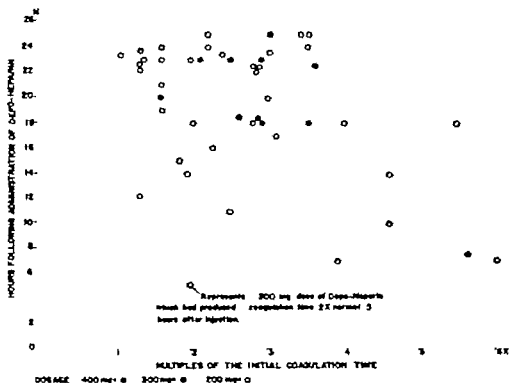


Figure 1—Scattergram showing the coagulation times in multiples of the initial coagulation time plotted against the elapsed time after injection of a given dose of the depo-heparin.

A scattergram was prepared to show the levels obtained (fig. 1) in the first 24 hours and for the entire period of depo-heparin administration until the second or third day of dicumarol therapy when the prothrombin time was about twice normal. It is observed that by using a smaller dose of depo-heparin on the second and third days there was an erratic change in the coagulation time after dicumarol therapy was started. The average initial coagulation time for these

Table 1. The 7 of coagulation time and response of drug in 15 patients.

[illegible]

See results, case report.  
 Reported several different lesions.  
 Not included here.

patients was 10 minutes and 20 seconds at room temperatures of 23° to 26° C (77° to 78.8° F). Multiples of the original coagulation time up to 6 usually did not exceed 45 minutes and none were extended to 1 hour. Thus it can be seen from the scattergram that although many end points are outside the arbitrary range of 2 to 3 times normal all would seem to be within reasonable limits of safety. No hemorrhages occurred. The most noteworthy features appear to be: (a) Most of the coagulation times were 2 to 4 times normal and averaged 20 to 40 minutes. (b) Usually near the end of a 24-hour period a decrease in the coagulation time was noted. (c) The coagulation time of one patient increased 6 times with the initial dose of depo-heparin. He had been given dicumarol elsewhere but because red blood cells were found in his urine the dicumarol therapy had been discontinued. The initial coagulation time was 7¼ minutes, and the prolongation was still only 45 minutes in actual time. This patient's great activity and the consequent increased circulation apparently increased the rate of absorption from the depo-heparin deposit.<sup>2</sup> There was no return of the hematuria. This patient subsequently proved to have myocardial ischemia and evidence of an old infarct but apparently sustained no new injury on this occasion. (d) His coagulation time was permitted to fall below the arbitrary optimum range when it became evident that his prothrombin time was approaching the therapeutic level. (e) Table 1 which incorporates the essential data shows that no difficulties were encountered in switching from depo-heparin to dicumarol. Three patients were started on dicumarol therapy immediately and only two injections of depo-heparin were required.

*Effect on prothrombin time*—Examination of the data for the first day of depo-heparin alone failed to reveal any significant change in the prothrombin time. Three records showed an average 10-second increase in the dilute plasma prothrombin time; a fourth showed a decrease of 10 seconds; the others showed practically no change. While plasma prothrombin time averaged about 1 second longer, which is within the range of probable error.

*Intoward reactions*—No undesirable systemic effects were observed from any of the injections given (dosage ranged from 200 mg. to 400 mg.) but five mild local reactions occurred. One patient developed an erythematous elevated area of the skin over the injection site that resembled a giant urticaria in appearance and was slightly tender but did not itch. Four patients complained of local pain 12 to 24 hours after the injection. Inadvertently one of these was

<sup>2</sup> R. SCHWARTZ, H. and E. KROGER, G. G. Effect of temperature on blood flow and deep tissue temperatures in human forearm. *J. Physiol.* 102: 25-30, J. no. 30, 1943.



given intramuscularly. Another was in a hyperactive patient whose coagulation time was six times normal. He admitted having rubbed the area vigorously which probably accounted for the pain. Objectively some soft swelling was suggestive of a small extravasation of blood. Within 24 to 48 hours after the injection nothing was visible or palpable except the mark where the needle entered the skin.

*Clinical results*—Of the 15 patients in this series, 14 recovered. One patient with a massive myocardial infarction entered the hospital on the fourth day following the onset of pain and was given depo-heparin which produced coagulation times in the "ideal" therapeutic range. He was subsequently satisfactorily maintained on dicumarol, but despite other supportive measures he developed ventricular tachycardia which did not respond to medical management and he died on the seventh hospital day. At autopsy the presence of a myocardial infarct was confirmed and evidence of congestive heart failure was found. No evidence of subintimal hemorrhage, hemorrhagic phenomena, or embolic phenomena were found.

In another patient an extension of posterior apical infarction occurred on the sixteenth day after the original infarct, 12 days after depo-heparin was discontinued, when the prothrombin time suddenly dropped to 23 seconds (normal 15). The anticoagulant effect of depo-heparin had been entirely within the therapeutic range. This patient had been persistently overactive from the beginning, refused to use the oxygen provided, and continued to smoke. After the second episode he was more cooperative and made a good recovery.

The patients with thrombophlebitis improved without signs of further extension or emboli and with little or no residual damage. While statistically not significant, the results from this small series of patients compare well with statistics available from extensive composite reports dealing with the use of anticoagulants.

### SUMMARY

Depo-heparin without vasoconstrictors can be used effectively as an adjunct to dicumarol therapy. A suitable check on the therapeutic level is the modified Lee-White method of determining the coagulation time which will give a normal average end-point between 5 and 15 minutes. Making this determination once a day near the end of the 4-hour period following injection should be sufficient for the average patient. The administration of depo-heparin without vasoconstrictors in doses of 300 to 400 mg. initially and 200 to 300 mg. given 3 to 4 hours later on successive days gives a decrease in coagulation

time of 2 to 4 times normal. A single injection of this dosage will give a lengthened coagulation time of 2 to 4 times normal for about 24 hours. No complications were encountered either in control or management while combining depo-heparin with dicumarol and the switch-over was accomplished with ease. The prothrombin time was not appreciably changed by depo-heparin during the first 24 hours when it alone was used. The effect of dicumarol was reflected by the increased prothrombin time for all practical purposes as if it were being used alone. No significant discomfort follows the use of depo-heparin provided it is injected at body temperature into the deep subcutaneous tissues. This is superior to intramuscular injection. To obtain optimal results, the patient should be cautioned not to apply pressure at the site of injection.

#### CONCLUSIONS

A satisfactory anticoagulant effect was produced during the first 24 hours by a single adequate injection of depo-heparin. The trend of opinion among the medical officers who observed these patients is that depo-heparin is a satisfactory adjunct when used with dicumarol.





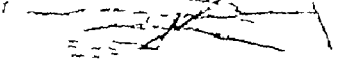
# A Pressure Method of Investment

PREPARED BY *Wm. L. Bennett, U. S. Army Dental Surgeon*

THE problem of obtaining a "bubble free" investment of wax patterns and stone dies has vexed the dental profession ever since the precision casting of wax models was developed. Many aids to the alleviation of this trouble such as vibrators and surface tension reducers have appeared and have helped but the percentage of gold spurs and nodules present still appears high in the finished castings as performed by the dentists and technicians who do not use auxiliary mechanical apparatus. Although the use of negative pressure (vacuum) investment machines gives highly satisfactory results, the cost of a commercial vacuum machine is usually beyond the means or needs of the average general practitioner and is not always obtainable for the average Army dental clinic. Although a vacuum apparatus can be improvised by using the water column from a sink faucet, in many cases the tap water pressure is insufficient to create enough negative pressure in the short span of time needed to dissipate the air bubbles next to the pattern before primary crystallization of the investment begins.

In contrast to the negative pressure technique of removing air from the investment at this hospital a positive pressure device is used. The theory underlying this type of investment is that pressure applied will be equal in all directions and the air will be reduced in volume by the square of the number of atmospheres of pressure applied. From a clinical viewpoint it must be admitted that even with the most careful investing technique air in the form of bubbles will be present in the investment but by applying pressure the size of the bubbles will be decreased to the point at which they will produce negligible end results. The pressure device is of simple construction, consisting of an air valve gage, a 6-inch length of pipe with a 3/4 inch diameter and two threaded pipe caps, one of which has the air gage threaded through it (fig. 1). Artificial stone is used to build up the inside of the lower cap to reduce the number of turns necessary to effect closure and to form a base for the rubber gasket.





Investing for this type of device consists of (1) painting the dried wax pattern with investment (2) placing the ring on the prime base and sealing the ring to the base with red utility wax by hand pressure to stabilize the ring for handling (3) filling the ring with investment (4) placing it on the lower cap (fig. 2) (5) screwing the lower cap to place and advancing the air pressure to the number of atmospheres desired, and (6) maintaining this air pressure for the period of investment set which can be determined by leaving out a test damb.

Figure 3 illustrates the potentialities of this type of investing. Both patterns were invested from the same investment mixture. The mold on the left was painted and then vibrated moderately and allowed to set; the mold on the right was merely poured and subjected to pressure for 15 minutes. This pressure method is also used for pouring stone dies for crowns and inlays made by the indirect method. The dies obtained by pressurizing are not only free from bubbles but seem to be more dense and, as a consequence, less liable to marring and chipping. One hundred inlays and crowns have been invested by this technique, and in no instance were spurs or nodules present on the castings.

### CONCLUSIONS

The results obtained thus far with the pressure investing technique are more than satisfactory. Costs of construction of the chamber are negligible because scrap and salvage materials can be used. The time element as compared to other techniques is not increased. In a preliminary study of 100 investments under pressure none showed faults caused by bubbles in the investment. Forty-five pounds (about 3 atmospheres) of air pressure is used at this station. In accordance with the theory used, the air bubbles present will be compressed to one-ninth their original size, thus presenting a minimum of faults.



# An Electric Defibrillator for Cardiac Resuscitation

JOHN H. STOVER, JR., Lieutenant Commander, U. S. N.

**R**ECENTLY Johnson and Kirby reported a series of successful cardiac resuscitations using an electric current of moderately high amperage applied directly to the heart. I have designed and constructed a defibrillator to replace their original experimental apparatus. Because ventricular fibrillation is a matter of great concern to surgeons, it is believed that a description of the device may be of general interest.

*Design considerations*—The apparatus (1) should deliver 2 amperes on short-circuit test of the electrodes, (2) must be safe, and (3) must be reliable.

*General description*—The defibrillator consists essentially of an isolating transformer, a current limiting resistor, and a reliable fast acting electric switch. It is also reassuring to the surgeon to read a meter before attempting cardiac defibrillation. In my apparatus, additional testing circuits are included, these are intended primarily for convenience in animal experimentation when it may be desired to change the current. The circuit diagram (fig. 1) shows the basic circuit in heavy lines and the auxiliary test circuits in light lines.

## TECHNICAL DESIGN AND CONSTRUCTION FEATURES

*Power*—The values and power ratings indicated in the list of components will reliably supply 2 ampere pulses.

The Johnson Foundation for Medical Physics is a reality of Pennsylvania in Philadelphia, Pa., at the time his article was written, now with the Department of Biophysics, the Johns Hopkins University, Baltimore, Md.

J. H. Stover, Jr., and K. K. Pearson, research team, R. C. North America, 29 1745 1752, Dec. 1949.

Johnson, J., and Kirby, C. K. Personal communication.

If the defibrillator is to be used in an emergency (anywhere it should be completely sealed in a shelling can, or gasproof unit) it should be employed.



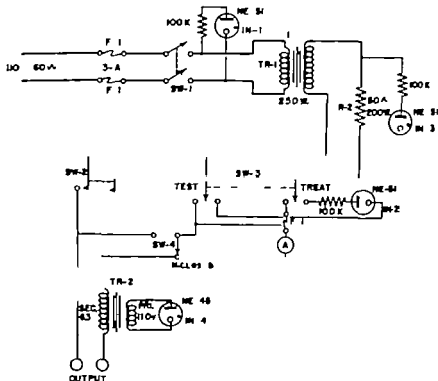


Figure 1—Schematic circuit diagram.

Safety features were a major concern.

(1) Isolating transformer.—It is possible to obtain 2 amperes directly from the house current through a limiting resistor. However, since one side of the line is customarily grounded, one of the electrodes is "hot." In many operating room suites the patient is intentionally grounded, and since the surgeon may also be grounded (wet floor grounded grid in floor) a direct path is provided for the flow of a potentially lethal electric current. This was a major objection to the original Johnson-Kirby apparatus. The condition was corrected by employing an adequately rated "isolating" transformer. With the transformer in the circuit, neither electrode is "hot" with respect to ground. The patient may be grounded or not as desired and the surgeon does not have to worry about an electrical ground because of a tan glove.

(2) Defibrillator switch.—Because the heating effects of a 2-ampere current are great, the shock must be of short duration—about 0.1 sec. (consultation with the electrocution and mechanical methods of execution cut off for 0.1 sec. Although a ruggedly constructed

"micro" push type switch with a telegraph key button a warning sign reading "strike and release fast" and a large indicator jewel that glows during the flow of the defibrillating current (fig. 2) is satisfactory an automatic timer would be desirable if personnel not familiar with the apparatus are required to operate it.

(3) Electrode current.—The device is so arranged that the electrodes are always "dead" unless the operator is actively maintaining pressure against either the "defibrillate" switch or simultaneously maintaining pressure against the "selector" and "electrode test" switches. Whenever the electrodes are conducting current, the large jewel glows. To accomplish this, a small filament transformer is used to provide a surge to fire the neon lamp.

(4) Fuses.—Both sides of the line and the meter are fused at 5 amperes. Small panel mounting fuses are used.

(5) Binding posts should be of high quality and completely insulated.

(6) Test circuit safety features.—To preclude the possibility of the selector being set on "test" when the surgeon desires to defibrillate, the indicator jewels flash—yellow for "test" and red for "treat." In addition the selector is a toggle switch with a spring return from one side i. e., pressure must be maintained against it for "test," but for "treat" it is merely flipped to the other side. For testing the continuity of the electrode and the electric cord the selector switch must be

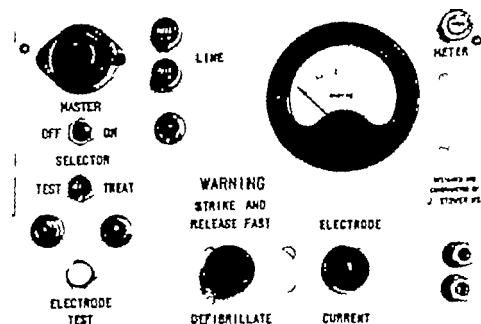


Figure 2—Front view of panel electrodes not connected.

set at "test" and the "electrode test" push button must be depressed and held.

### RELIABILITY FEATURES

High quality components are used throughout.

*Neon indicator lamps*—These are long lived, quick lighting and stand up under mechanical shocks better than filament type lamps. More important, failure of a neon lamp does not result in a change in the output of the defibrillator, but failure of a filament type would. The alternative of using low voltage filament bulbs involves an additional transformer and switch contacts, and hence more potential failure points.

*Connections* are soldered throughout. If direct connections are used, lock washers should be inserted.

### ELECTRODES

The electrodes used by Johnson and Kirby were oval copper plates measuring about 2 by 3 inches, and soft enough to be molded about the heart. A high quality rubber-covered electric cord was soldered to the electrodes, and pin tips were soldered to the defibrillator end of the cord for insertion in the binding posts of the defibrillator. Such a cord has withstood weekly autoclaving for a year. If cold sterilization is used, a conventional outlet and plug can be employed. At present we are testing a simple two-conductor banana plug (which the binding posts we employed also accept).

### OPERATION

*Bare circuit type*—Plug in to 60-cycle line. Switch on. Connect electrodes, and bring them in contact with one another. Depressing defibrillator switch should cause large jewel to glow. To defibrillate, place on heart and give defibrillator switch a quick, glancing blow.

*Bare plus test circuit type*—Plug in to 60-cycle line. Switch on. When selector switch is held on "test," the meter will indicate the amperage that the device will supply on short circuit of electrodes. To check electrodes and cords for continuity, connect electrodes, bring in contact, hold selector on "test," and depress "electrode test" switch. The large jewel will glow and the meter will indicate the amperage actually flowing through electrodes. This method may also be used for determining the current flowing through heart of an experimental animal. For defibrillation, set the selector on "treat" and when ready, strike the defibrillator button as before. The meter will not indicate, but the large jewel will flash. This is to discourage operators from holding the defibrillator button down long enough to get a reading at the expense of the patient's ventricular muscle.

The small "test" and "treat" indicators may blink alternately if cardiac resistance is low.

### LIST OF COMPONENTS

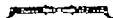
#### *Basic type*

- TR-1 One isolating transformer 115 V. 1:1  $\frac{250}{100}$  watt (Standard type I 0161)
- R-2 One voltage divider ceramic 4  $\frac{1}{2}$  watt 100 ohm 50 watt
- SW-1 One double-pole single-throw line switch, 1 ampere 115 volt
- SW-2 One defibrillator push switch—double pole single throw  
Must be spring return to open position (Micro switch, Type DBRH1 Serial No. A rugged, smooth acting shaft; tapped so large telegraph key button may be used. Terminal 1 and 6 are not used)
- IN-1 One panel indicator light assembly for type No. 51 neon bulb (red amber or clear only). Some assemblies have built in resistor. If not, a 100,000 ohm  $\frac{1}{2}$  watt series resistor (R-1) must be used.
- IN-4 One panel indicator light assembly large (1 inch) for type No. 4 neon bulb (red amber or clear only). No dropping resistor necessary. A small assembly and No. 1 bulb plus 100,000 ohm  $\frac{1}{2}$  watt resistor may be used here.
- TR-2 One filament transformer—6.3 volts or 2.5 volts
- F-1 Two fuse holders and two 3-ampere fuses (such as size "3 AG").
- Electrodes, electrode cord and connectors.
- Line cord.
- Case and panel or "bread board."

#### *Additional parts for test circuit*

- AM One radio frequency or alternating current ammeter 0-3 amperes panel mounting, 3 inch.
- F-1 One fuse mount and 3-ampere fuse (for meter protection)
- SW-3 One double pole double throw three-position toggle switch with spring return from one "on position to "off" position 3 amperes 110 volts.
- SW-4 One single pole double throw push button switch normally closed, spring return from open position (standard "micro" switch)
- IN-2, IN-3 Two small indicator lamp assemblies and 100,000 ohm  $\frac{1}{2}$ -watt resistors (R-1) for No. 11 neon bulbs—one red, one clear or amber jewel.

It has been suggested that transformer 1 be supplied with built in line cord. In addition it has switch for setting to local volt. If basic type defibrillator is constructed, AC ammeter should be connected across output of defibrillator and transformer switch should be set 1 position which most nearly gives correct values. With line voltage of 115 these taps give 1.3, 1.2, and 1.1 amperes respectively.





# Arterial Blood Culture

MELVIN B. SULLIVAN, JR., Lieutenant Junior Grade MC U S N R.  
CLIFFORD L. POWELL, Captain MC U S A.

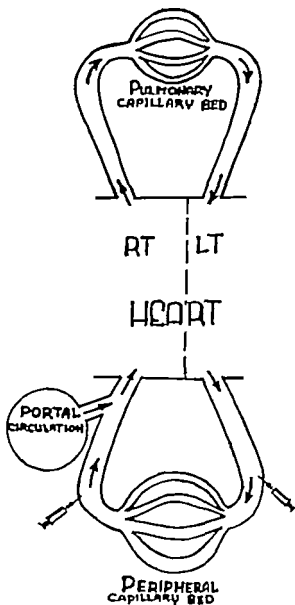
WITH the advent of new and specific antibiotics for the treatment of blood borne infections, it is essential to determine the exact etiologic agent and its sensitivity to the various antibiotics with a minimum of delay. With this in mind it is considered advantageous to use the described technique for arterial blood cultures as an adjunct to routine venous blood cultures.

## CASE REPORT

A patient with most of the clinical findings of subacute bacterial endocarditis, but with negative venous blood cultures, was transferred to this hospital after unsuccessful treatment with penicillin and caronamide. In view of the previous therapeutic failure and the long term therapy likely it was deemed urgent to have the infecting organism isolated and its sensitivity to the antibiotics determined. At the suggestion of a civilian consultant an arterial blood culture was taken. It was positive for *Streptococcus viridans* while the concomitant venous culture was negative making possible the sensitivity studies which demonstrated the need for large doses of penicillin (12,000,000 units daily). This therapy effected an apparent cure without any evidence of a remission 9 months later.

The rationale for the procedure is shown in figure 1. The primary sites for blood stream infection are through the peripheral circulation, the portal circulation, the pulmonary circulation and the heart. The rationale for proposing the arterial culture as a more accurate means of diagnosing blood borne infections is theoretical. There may be a filtering action exerted on the bacteria as they pass through the pulmonary and peripheral capillary network at a reduced speed. That such a phenomenon exists is suggested by the peripheral petechiae

1. P. N. Ellwood, Philadelphia, Pa.  
Dennis T. M. Personal communication.



# FILTRATION DIAGRAM

Figur 1

seen in subacute bacterial endocarditis and by the comparative increase in positive arterial blood cultures as compared to simultaneously drawn venous blood cultures. Murray and Mosnick reported a comparative study on 27 cases of possible septicaemia in which 15 were proved by blood cultures. In this group there were 6 positive venous blood cultures with one negative companion arterial culture. In the same group, 14 positive arterial blood cultures were obtained with 9 negative companion venous cultures. This represented an increase of 133.3 percent in accuracy of diagnosis; that is, arterial cultures were  $2\frac{1}{3}$  times more effective.

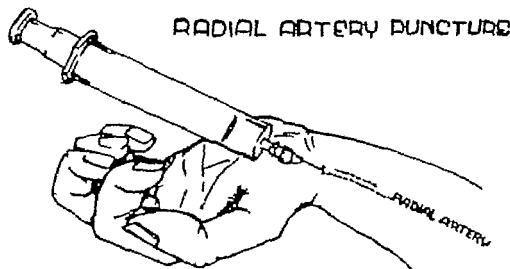


Figure 2

The radial artery has proved to be easily located and punctured without causing excessive pain. The technique in brief is to cleanse the area over the artery at the wrist with iodine and using a 21-gauge needle enter the skin at about a 30-degree angle (fig 2). If pressure is released for a moment after the needle penetrates the skin, the artery will tend to roll back under the needle and minimize probing. No tourniquet is necessary and there is not a vein of sufficient caliber to enter in this area. If the radial artery is not easily palpable, the femoral artery is a satisfactory substitute. Usually the pain is not of sufficient magnitude to require an anesthetic and momentary local pressure is adequate for hemostasis.

It is believed that this procedure has a definite place in our diagnostic armamentarium although as yet it has not been adequately evaluated. Our facilities prohibit a prolonged simultaneous com-



parison of the venous and arterial blood cultures, and it is hoped that this article will stimulate such a study.

#### CONCLUSIONS

The need for early determination of the specific infecting organism and its sensitivity to the antibiotics has become important with the development of a variety of new antibacterial agents. The relatively unused arterial blood culture is suggested as an improved means of obtaining this information at the earliest possible time.



# The Dynamics of Lumbar Puncture

GORDON T. WATHAMAKER, *Captain MC U S A*

SOME of the most elementary principles of physics are often overlooked in performing a lumbar puncture. The spinal tap, consisting of inserting a needle into the subarachnoid space of the lumbar region for the purpose of determining the spinal fluid pressure or obtaining spinal fluid for laboratory examination for diagnostic purposes, is a relatively simple but occasionally dangerous procedure, the danger being caused by failure of the operator to comprehend the dynamics involved and to avoid sudden changes in pressure. Spinal taps performed for suspected increase in intracranial pressure and spinal cord lesions producing blocks require moderately different technique.

Spinal taps can be performed safely on any patient suspected of having increased intracranial pressure or a tumor in the posterior fossa provided there is no sudden change in the dynamics. This necessitates the employment of a closed system throughout the entire procedure with gradual changes of pressure. The tap should be performed with the patient lying on his side and never in the sitting position. Under no conditions should the needle be inserted into the subarachnoid space, the stylet removed, and the spinal fluid allowed to spurt freely while the manometer is being attached. It is well to remember in performing the spinal tap that one is dealing with fluid under pressure in a closed system and pressure changes in one part are reflected throughout the entire system. In the presence of increased intracranial pressure a sudden release of pressure from below may cause one of two serious complications (a) slight downward displacement or herniation of the contents of the posterior fossa of the cranial vault and (b) herniation of the hippocampal gyrus through the tentorial notch compressing the midbrain.<sup>1</sup> Herniation

<sup>1</sup>Walter Reed Army Hospital, L. W. Blount, D. C.  
J. H. Cerebrospinal hydrodynamics: clinical pertinent statistics. Arch. Neurol. & Psychiat. 24: 577-583, Sept. 1921.  
Rev. W. L. Lumsden, on fluids and cisterns I put on their indication and the  
d. nerve. M. J. A. cells 1: 231-237 April 10, 1913.

of the cerebellar tonsils and medulla through the foramen magnum may cause death either by severe damage to the vital centers of the medulla or by increasing congestion of an already poorly compensated brain.

The following procedure is recommended to prevent sudden changes in the spinal fluid pressure, to allow one to record safely the pressure, and to obtain sufficient fluid for laboratory tests. With the patient lying in the lateral recumbent position under local procaine anesthesia, a No. 18 gage spinal needle is inserted into the interspace be-



*Figure 1—Showing tip of spinous process of the fourth lumbar vertebra held between thumb and index finger left hand with insertion of 18-gage spinal needle between spinous processes of the fourth and fifth lumbar vertebrae.*

tween the fourth and fifth lumbar vertebrae which usually lies on a line drawn through the iliac crest. To facilitate insertion of the needle in the midline it is helpful to grasp the lower tip of the spinous process of the fourth lumbar vertebra between the index finger and thumb (fig. 1) and to insert the needle just below this point in the usual manner down to the interlaminar space where it will meet resistance at the ligamentum flavum. At this point the stylet is withdrawn and the water manometer attached horizontally to the needle. A small drop of sterile saline solution is placed just below the junction of the tube of the manometer. The three-way stopcock is opened

between the needle and the manometer (fig. 2a). The needle with the manometer attached is then pushed in further with the left hand the right hand supporting the manometer. As the point of the needle passes through the ligamentum flavum into the epidural space the drop of fluid in the manometer flows toward the needle showing an area of negative pressure. The index finger of the right hand is then placed over the free end of the manometer to act as a ball valve so that pressure within the manometer can be controlled. The needle is then inserted into the subarachnoid space. At this point the drop of fluid in the manometer will start to flow away from the needle as the first drop of spinal fluid enters the needle and before spinal fluid is visible in the manometer. The manometer is then rotated to the vertical position (fig. 2b). Using the right index finger as a valve over the open end of the manometer the drop of saline solution is allowed to rise slowly until the spinal fluid is apparent in the manometer and similarly the spinal fluid is allowed to rise at the rate of 1 cm. per second until the initial fluid pressure is obtained. Thus there is no sudden change in the dynamics of the spinal fluid and the pressure is obtained without danger to the patient. As a check on the accuracy of the obtained pressure one must make sure there is no block at the point of the needle by noting the slight fluctuation of pressure in the manometer synchronous with respiration and cardiac pulsation. The fluid in the manometer is then drained into a test tube by means of the stopcock. Each segment of the manometer contains about 1 cc. Similarly the manometer is again filled, pressure obtained, and fluid collected in the test tube. From 2 to 3 cc. of fluid are usually sufficient for total protein determination and the cell count. The stopcock is turned off and the needle quickly withdrawn. The Queckenstedt test is contraindicated in the presence of increased intracranial pressure as it further increases the pressure from above forcing the brain down, and may result in death or serious complications.

In suspected complete or partial spinal canal blockage lumbar puncture is of great diagnostic aid if properly performed. The method employed should be standardized so that the results obtained can be easily duplicated by other observers as is often necessary in the Army chain of evacuation. Furthermore, the procedure employed should allow one (a) to follow the changing degree of block of an expanding or subsiding lesion by performing serial tests or (b) to check the effects of therapy instituted to relieve the cause of block. The needle is inserted below the level of the suspected block, usually between the fifth lumbar and the first sacral vertebrae. An 18-gage spinal needle should be used because a needle of smaller bore results in delayed pressure readings. The closed system of inserting the needle and obtaining the initial pressure as previously described is de-

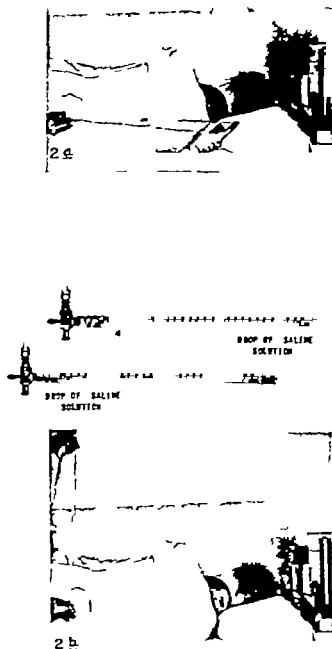


Fig. 2.—Showing closed technique employing drop of saline solution as an indicator for localization of tip of spinal needle. The drop going down in the epidural space showing negative pressure and up in the subarachnoid space showing positive pressure. Arrows indicate direction drop will travel from original position below.

sirable. An initial loss of a few cubic centimeters of spinal fluid in the presence of a complete block in the spinal canal may so reduce the pressure below the block that fluid does not rise in the spinal fluid manometer particularly if the tap is being performed in the prone position in which the fluid must rise vertically through the length of the spinal needle before the column of fluid becomes visible in the manometer.

After the initial pressure is obtained it is ascertained that there is no blockage of flow of fluid at the spinal needle point. Such blockage may be caused by a nerve root lying adjacent to the needle aperture acting as a valve. Such an obstruction of the needle would give inaccurate results in relation to changes of fluid pressure within the subarachnoid space. If there is no obstruction of the needle there will be changes in spinal fluid pressure with cardiac pulsation deep in inspiration and expiration, sneezing, coughing and straining. Such changes are present even below the site of complete block. This does not mean that there is free communication of flow of spinal fluid from the cranial vault down to the site of insertion of the spinal needle. Such changes merely reflect changes of venous pressure within the spinal canal.

Thus assured of a patent needle, the initial pressure of spinal fluid in millimeters of water is recorded. The cuff of a sphygmomanometer is wrapped about the patient's neck (fig. 2) explaining the reason for this to the patient. A bilateral Queckenstedt test is performed by having an assistant pump up the sphygmomanometer cuff 10 mm. of mercury each 10 seconds until 40 mm. of mercury is reached. The spinal fluid pressure is recorded at the completion of each 10 seconds. Then at 10-second intervals the sphygmomanometer pressure is lowered 10 mm. of mercury until zero mm. pressure of the cuff is obtained and the spinal fluid pressures are recorded (fig. 3).

Normally the pressure will rise rapidly and fall at the same rate. In a partial obstruction the rising component of the curve will be flat at first, then as the increase in pressure above the block becomes great enough to force fluid past the partial obstruction there will be a more rapid rise. There is a direct relationship between the amount of pressure required from above (i. e., in the sphygmomanometer cuff) to force fluid past the partial block and the degree of block. After release of the cuff pressure and thus the pressure of spinal fluid above the lesion there is a much slower reduction of pressure below the lesion so that a flattened or slowly falling curve is produced. The length of time required for the pressure to return to the initial level is again in direct proportion to the degree of partial block, often taking 3 or 4 minutes.



tentially paraplegic patients at this center. In several patients a partial block has been reduced by hyperventilation and surgical decompression has thus been avoided. Other patient in whom a partial block showed signs of increasing were decompressed surgically with excellent postoperative results.

#### SUMMARY

The closed system for performing lumbar puncture is safe and avoids sudden changes of pressure in all patient in whom increased intracranial pressure is suspected. When properly performed the closed system enables the operator to obtain valuable information about spinal fluid pressure, cell count and chemistry. Graduated jugular compression in the lumbar manometric test for spinal subarachnoid block is of particular value in following patient with back injuries and paraplegia. Standardization of this procedure at all medical installations along the chain of evacuation to a neurosurgical center would be of great value in determining the progress of the lesion, formulating its prognosis and instituting proper therapy.







# Myocardial Infarction in Young Adults

MASON R. BAKER, *Capt in U S A (MC)*  
WILLIAM R. SCHILLHAMMER, JR., *Captain MC I* 1

**M**YOCARDIAL infarction in young adults is seldom seen by the practicing physician. The following cases were studied at this hospital.

## CASE REPORTS

*Case 1*—A 22 year-old soldier had been in excellent health except for occasional pain in the left anterior side of his chest until 2 days prior to admission to the hospital. At that time he suffered a severe substernal pain which lasted only a few seconds. This soon disappeared and he felt well until that evening when while sitting on his bed in his barracks, he suddenly felt as though he were gagging, and fainted. It is not known exactly how long the patient was unconscious but when he recovered he felt well for the remainder of the night. He reported on sick call the following morning and no abnormalities were found on physical examination, but an electrocardiogram (EKG) taken at that time showed a left bundle branch block (fig 1). The soldier was called from work to the hospital on 14 April 1960. He was feeling well and had no complaints when he entered the hospital.

On physical examination the pulse was 60 and a slurring of the first heart sound was heard at the apex. The patient's course in the hospital was uneventful. There was no fever. The pulse varied from 45 to 70 beats per minute and was regular. The patient was kept in bed for 4 weeks with no other form of therapy and he remained asymptomatic while in the hospital. Serial EKG's showed a persistent left bundle branch block with changes suggestive of myocardial infarction (fig 2). He was transferred to Madigan Army Hospital, Tacoma, Wash., in excellent condition 6 weeks after admission.

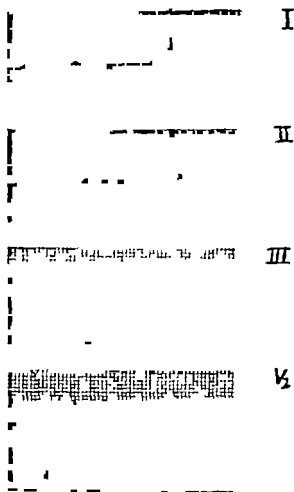


Figure 1.—Case 1. EKG taken 17 April 1950. Note prolongation of QRS complex and slurring and notching. Also elevation of ST and chest lead V.

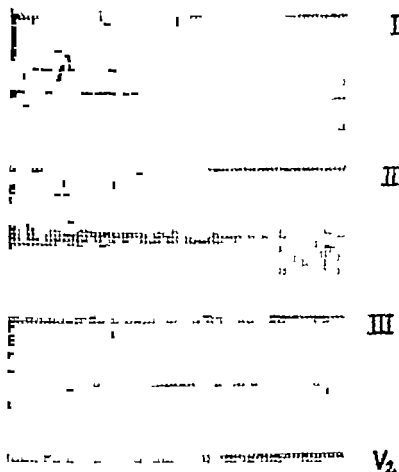


Figure 2—Case 1. ECG taken 15 May 1950. Note prolongation of QRS complexes with slurring and notching and elevation of ST segment in chest lead V<sub>2</sub>.

*Case 2.*—A 40-year-old airman, was seized with a sudden severe sub-sternal pain and feeling of tightness while on duty at Cape Air Force Base Aleutian Islands, 13 April 1950. These symptoms were accompanied by dyspnea, weakness, and sweating. For 2 years prior to this attack, he had had occasional episodes of severe aching sub-sternally associated with exertion, relieved by rest. There was no history of rheumatic fever, joint or tendon pain, or prior knowledge of cardiac disease. Physical examination revealed a well-developed man who appeared to be acutely ill. The skin was warm and dry. There was no rash. There was dullness to percussion over the left side of the chest posteriorly from the seventh rib to the base, and the breath sounds, tactile, and vocal fremitus were decreased over this area. There were a few scattered rales in the left side of the chest. The pulse was 90. The blood pressure was 120/80. There were no mur-

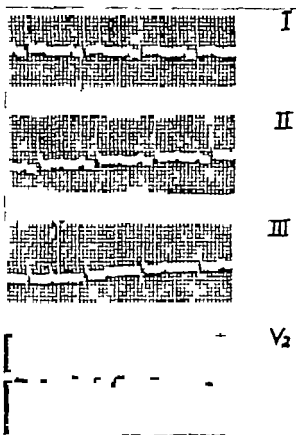


Figure 3.—Case 2. EKG taken 17 April 1950. Note elevation of ST segment and inversion of T in chest lead V.

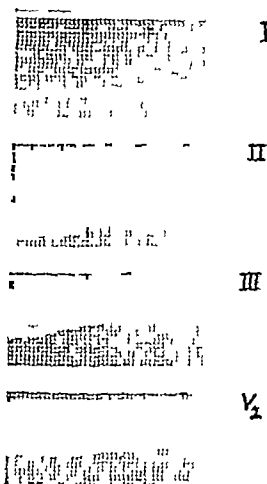


Fig. 4.—Case 2. EKG taken 1 May 1950.  
Note ST segments flat. T in lead II  
still inverted.

mura. A definite pericardial friction rub was heard at the left fourth interspace beneath the sternum. The oral temperature was 101° F.

The patient was transferred to this hospital with a diagnosis of pericarditis, secondary to old myocardial infarction or rheumatic fever. The physical findings were as described. The urine contained from 10 to 15 granular casts per high power field. The hemoglobin was 12.4 grams per 100 cc. The sedimentation rate was 36. Blood culture was negative. An EKG (fig. 3) taken on 17 April 1950 revealed changes consistent with anterior myocardial infarction. A roentgenogram of the chest was negative except for slight cardiac enlargement. In the hospital the patient gradually and progressively improved. The sedimentation rate gradually decreased to 16 within 4 weeks. Serial EKG's showed progressive improvement (fig. 4). The treatment consisted of bed rest, sedation and supportive measures. Four weeks after admission the patient was transferred to Madigan Army Hospital, Tacoma, Wash., in excellent condition.

## DISCUSSION

Very few reports of cases of myocardial infarction in young persons have appeared in the literature. The youngest patient, an 18-year-old male, was reported on by Jameson and Hauser. Zinn and Cosby reported 670 cases of routine postmortem examinations with myocardial infarction analyzed statistically with the results as shown in table 1.

TABLE 1.—Analysis of 670 cases of myocardial infarction

Age	Male	Female	Age	Male	Female
20 to 24			60 to 64	20	20
25 to 29			65 to 69	14	11
30 to 34			70 to 74	10	10
35 to 39		1	75 to 79	12	17
40 to 44	11	1	80 to 84	31	17
45 to 49	2		85 to 89	3	4
50 to 54	20	10	90 to 94		1
55 to 59	43	13			

Jameson, W. J. and Hauser, R. S. Myocardial infarction: statistical analysis of 670 autopsy-proven cases. *Am. J. Med.* 100-170, Feb. 1970.

Fagin and Chapnick reported 100 ambulatory patients with electrocardiographic findings of myocardial infarction. They classified these patients as (1) asymptomatic, (2) typical, and (3) atypical. In the first group there were no symptoms referable to the heart; in the second group the patients had histories of acute episodes compatible with the clinical findings of myocardial infarction and followed by disability of varying duration; and in the third group the patients had symptoms of cardiac insufficiency of varying degrees of severity but no history of an acute attack of chest pain of sufficient severity to warrant recognition by the patient, or his physician, as a heart attack. The age incidence in these groups was as shown in table 2.

TABLE 2.—Age distribution of 100 patients with myocardial infarction

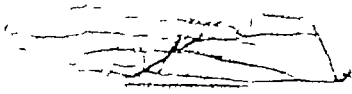
Age group	Asymptomatic	Typical	Atypical	Total
20 to 29	—	—	1	1
30 to 39	—	3	1	4
40 to 49	2	12	7	21
50 to 59	3	20	22	45
60 to 69	3	13	10	26
70 to 79				

Fagin, I. D. and Chapnick, H. A. Clinical patterns of myocardial infarction in ambulatory patients. *Ann. Int. Med.* 22: 253-256, Feb. 1970.

Jameson, W. J. and Hauser, R. S. Anginal pectoris in young adults. *J. A. M. A.* 213: 1369-1369, Oct. 31, 1970.

Jameson, W. J. and Hauser, R. S. Myocardial infarction: clinical analysis of 670 autopsy-proven cases. *Am. J. Med.* 100: 170, Feb. 1970.

Fagin, I. D. and Chapnick, H. A. Clinical patterns of myocardial infarction in ambulatory patients. *Ann. Int. Med.* 22: 253-256, Feb. 1970.



In the two cases here reported it was considered that myocardial infarction could be diagnosed from the EKG's. In case 1 there was left bundle branch block. During this patient's hospitalization the series of EKG's from 13 April to 15 May showed no change. This is usually the case in bundle branch block, that is, the changes are permanent. These patients often live normal lives without limitation of activity. In case 2, however, one can see improvement in the tracing over a 1 month period, as is so often the case in anterior or posterior myocardial infarctions. This man too may live a normal life. In young persons myocardial infarctions are most frequently nonfatal because the recuperating potentialities of the youthful myocardium are excellent.

#### CONCLUSIONS

It is strongly urged that all physicians who see young patients carefully evaluate pain in the left side of the chest. This is a problem testing to the utmost the astuteness of the general practitioner and internist.





TABLE 1.—Summary of medication given

Drug	Dose (times)	Date started	Date discontinued
Moracodin	0.30 b. i. d.	8-9-47	9-19-47
Moracodin	0.30 b. i. d.	9-23-47	9-27
Melonal	0.04 d.	9-14-47	9-19-47
Desiccated thyroid	Unknown	9-19-47	9-28
Thionin	10 daily	10-15	1-28-48
Penicillin	Unknown	1-28-48	1-29-48

She visited her physician on 23 December and reported that her health was the best it had been in years and that she had had only one petit mal seizure. Physical examination was again negative. She next consulted a physician on 10 January 1950 because her gums were sore and bled easily. She was treated with penicillin intramuscularly but the condition persisted. She consulted a dentist on 20 January and was given penicillin ointment for local application.

She was readmitted to the hospital on 24 January complaining of severe weakness and profuse vaginal bleeding of 4 days duration. Examination revealed a thin, pale lethargic acutely ill woman. She responded to questioning, although her responses were hazy. There were multiple purpuric areas on the skin of the arms and legs. These had been present for 2 weeks. The alveolar margins were hyperemic and had shallow ulcerations covered with a gray membrane. They bled easily on contact. There were several lesions of similar appearance on the posterior pharyngeal wall. The examination was otherwise negative. The erythrocyte count was 1,200,000 with 5.5 grams of hemoglobin. The packed cell volume was 17 percent and the leukocyte count was 11,100, with lymphocytes 100 percent. No platelets were seen. Urinalysis was negative. The icterus index was 5, the serum bilirubin was 0.35 mg. per 100 ml. The thymol turbidity was 1 unit and the cephalin cholesterol flocculation test was one plus in 48 hours.

Treatment consisted of supportive measures, antibiotics, and the substances thought to have hematopoietic properties. Therapy and hematologic studies are summarized in table 2.

Eighteen hours after admission, following transfusions of whole blood, the patient seemed improved clinically and was alert and responsive, although still pale. She complained of a headache. Twenty-four hours after admission she felt dizzy and had a few mild generalized tremors. She was nauseated and vomited shortly after these. She was very restless that night. Sternal marrow obtained on the third hospital day showed (after 2,000 cc. of whole blood had been given) 1 myeloblast, 2 myelocytes, 2 eosinophils, 5 erythroblasts and 3 normoblasts in 400 cells counted. The remainder of the cells were lymphocytes. That day the patient developed fever and her

TABLE 2—Summary of blood findings and therapy during second hospitalization in January 1950

Date of month	Hemoglobin (grams per 100 cc)	Red blood cells (millions)	White blood cells	Polychrome cells (percent)	PT (sec)	Sodium crystal (grams)	Whole blood (cc)	Prothrombin time (sec)	Crude liver extract (cc)	Vitamin D (micrograms)	Prothrombin (1,000 units)	Ascorbic acid (grams)
1/1	11.0	1.0	1,000	0	None	0.2	1,000	—	—	—	400	—
1/2	11.0	2.4	700	0	None	—	—	—	—	—	400	—
1/3	11.0	1.8	800	0	Normal	0.4	1,500	40	—	—	400	—
1/4	11.0	1.5	500	0	110	0.2	1,000	40	—	—	400	—
1/5	11.0	1.0	1,000	0	70	0.8	1,000	40	20	15	400	—
1/6	11.0	1.0	500	4	80	0.4	700	40	20	—	400	—
1/7	13.0	0.46	700	0	230	—	1,000	40	20	—	400	—

temperature rose to 100° F. The fever was accompanied by severe diarrhea and the stools contained bright red blood. The fever continued through the next 2 days. On the sixth hospital day she developed frequency of urination and gross hematuria. She continued to have the same symptoms and findings, gradually becoming weaker. On the seventh hospital day she began having shallow rapid respirations, cyanosis, and a cough productive of mucopurulent sputum. The lung bases became definitely congested. Within the next 6 hours she became severely jaundiced and lapsed into coma. Death occurred 7 days and 10 hours after admission.

The autopsy showed generalized purpura and icterus. Many of the purpuric lesions were necrotic. There was bilateral pneumonia and a left pleural effusion. There was uterine hemorrhage. The bone marrow was hypoplastic throughout.

#### SUMMARY

This patient died following the use of mesantoin and thiantoin. These drugs are not without dangerous hematologic complications. Blood studies should be made at least every 2 weeks during their administration.



# Hypogonadism

## Puberal Seminiferous Tubule Atrophy

RICHARD LAWRENCE, *Commander MC U S N*

ROBERT A. HELLER, *M D*

UNTIL recently the presence of testicular inadequacy in young men was generally recognized only in those who had early androgen failure with body disproportion characteristic of eunuchoidism. That hypogonadism may occur in the young adult with an apparently normal body type was reemphasized in the report by Klinefelter Reifenstein and Albright on the occurrence of gynecomastia aspermatogenesis with androgen secretion by the interstitial cells of Leydig present, and increased urinary follicle-stimulating hormone.

Heller et al<sup>4,5</sup> expanded our knowledge further when they classified their patients according to the time of onset of testicular failure, the resulting body disproportions, the urinary excretion of gonadotropin, and the type of pathologic changes involved. In their classification the condition in hypogonadal patients with or without gynecomastia but with seminiferous tubule atrophy occurring before or during puberty was termed "puberal seminiferous tubule atrophy." These patients were subdivided into noneunuchoid, moderately eunuchoid,

The Endocrine Clinic, U. S. Naval Hospital, San Diego, C. M.

The Scripps Metabolic Clinic, La Jolla, Calif.

KLINEFELTER, H. F., JR., REIFENSTEIN, E. C., JR., and ALBRIGHT, F. Gynecomastia characterized by gynecomastia aspermatogenesis without Leydigism, and increased secretion of follicle-stimulating hormone. *J. Clin. Endocrinol.* 2: 618-627 Nov. 1942.

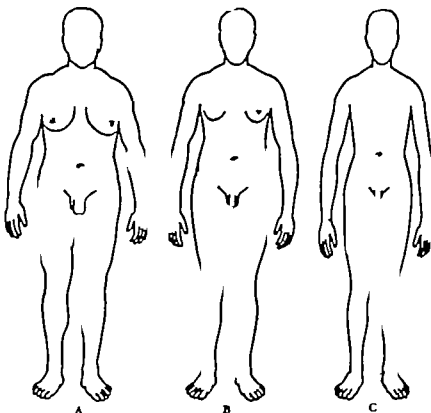
HELLER, C. G., NELSON, W. O., and ROTH, A. A. Functional prepuberal castration in males. *J. Clin. Endocrinol.* 2: 575-589 Nov. 1943.

NELSON, W. O., and HELLER, C. G. Hyalinization of seminiferous tubules associated with normal or falling Leydig-cell function; microscopic picture in testis and associated characteristics. *J. Clin. Endocrinol.* 3: 13-26, Jan. 1943.

HELLER, C. G., and NELSON, W. O. Clinical use of testosterone in male hypogonadism. *J. Clin. Endocrinol.* 3: 437-452, 1947.

HELLER, C. G., and NELSON, W. O. Classification of male hypogonadism and clinical use of pathologic physiology, diagnosis, and treatment. *J. Clin. Endocrinol.* 3: 345-364, May 1948.

and eunuchoid types, according to the size of the gonads and the body characteristics. In their series the most marked gynecomastia oc-



—Courtesy of the Journal of Clinical Endocrinology

Figure 1—Body types, breast, and genital development in hypogonadism. (A) Noneunuchoid. (B) Moderat eunuchoid (C) Eunuchoid

curring in patients with the least testicular atrophy and the most definite male characteristics (noneunuchoid). The relationship of the body characteristics and the degree of gynecomastia are shown in figure 1.

Although gynecomastia is not a necessary part of hypogonadism, the description by Klinefelter et al. is useful and emphasizes several of the diagnostic points which should lead the clinician to suspect hypogonadism. These are small insensitive testes without sperm production, an increased excretion of urinary gonadotropin, gynecomastia, and certain typical body disproportions.

HILLER, C. G. and KILBOY, W. O. Hyalination of seminiferous tubules associated with normal or falling Leydig-cell function: discussion of relationship eunuchoidism, gynecomastia, levated gonadotropin, depressed 17-ketosteroids and oestrogens. *J. Clin. Endocrinol.* 1: 12, Jan. 1943.

These patients are usually unaware of the significance of their endocrine disorder and have a natural reluctance to draw attention to their physical abnormalities. Usually they do not seek treatment for their unusual characteristics. Their endocrine dysfunction is often overlooked or considered not to warrant treatment. Because diagnosis is a relatively simple matter and treatment with testosterone is of considerable benefit it is believed that a discussion of this condition and a review of three typical cases may serve a useful purpose.

The condition is believed to begin during or before adolescence with atrophy of the tubules and disappearance of the germinal epithelium and Sertoli cells. The cause of it is obscure. Most patients give a history of childhood or pubertal infectious process such as mumps with or without orchitis.

In spite of the absence of tubular elements, the continued androgen production by the Leydig cells results in normal development of the

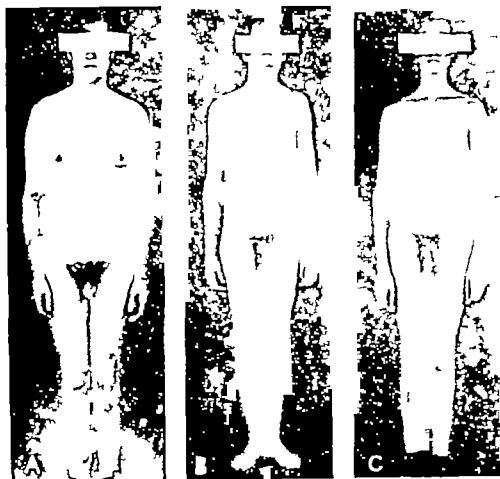


Figure 2—(A) Patient 1 eunuchoid (B) Patient 2 moderate eunuchoid (C) Patient 3 eunuchoid

penis, genital tract, prostate and pubic hair. Testicular biopsy (usually not necessary for diagnosis) reveals a dense stroma of Leydig cells with scattered atrophic hyalinized tubules and no germinal elements. Associated with these findings are those common to eunuchoidism (noted in our three cases) namely a low basal metabolic rate with a normal blood cholesterol, a low fasting blood sugar with a flat glucose tolerance curve and a low resting blood pressure and pulse. Patients with these findings are often treated with thyroid extract. This does not in any way alleviate the condition.

An important characteristic of this syndrome is a definite personality deviation. The person may be immature, nervous, unstable, and generally inadequate. These psychologic manifestations are benefited by androgen therapy.

In our three cases the complaints presented by the patient on admission were a sprained ankle (case 1) painful left gynecomastia with bilateral palpable gynecomastia (case 2) and extreme nervousness with neurotic trends (case 3). All three of our patients (fig. 2) had a penis of normal size, but had definitely atrophic testicles. All had sparse or absent beard and no chest hair. Gynecomastia of some degree was present in each patient. Our patient with the highest androgen excretion and the most male body type also had the most gynecomastia. Minimal gynecomastia occurred in the eunuchoid patient. This supports the observations of Heller and Nelson as shown in figure 1. Abnormally long extremities were present but the general body configuration was that of the adult male. The distance from the pubis to the heel exceeded the sitting height in each patient and armspread exceeded the height in two.

All three patients had increased urinary gonadotropins as measured by the increase in weight of rat ovary and mouse uterus after injection of a concentrated urine specimen. Testicular biopsy in each case revealed atrophic hyalinized tubules with a dense stroma of Leydig cells, as shown in figure 3. No spermatozoa were present in the semen. Ejaculation produced less than 2 cc. of semen in the eunuchoid patient, and about 4 cc. of semen in the two patients with the more masculine characteristics. The examination of the semen for spermatozoa is

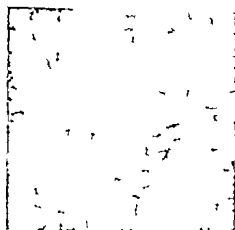
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Twenty-four hour urine specimens were precipitated with alcohol, washed with alcohol and ether and dialyzed according to Heller and Chandler. The purified precipitate was assayed in 22-day-old rats and mice with a ovarian weight, uterine weight, and vaginal opening as the end point.

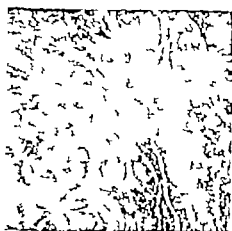
<sup>10</sup> HELLER, C. G., and CHANDLER, R. E. Gonadotropic hormone: modification of alcohol precipitation assay method. *J. Clin. Endocrinol.* 2: 232-233, Apr. 1942.

FEYERH, H. L. Extraction and standardization of pituitary follicle-stimulating and luteinizing hormones. *Endocrinology* 14: 421-446, Apr. 1929.

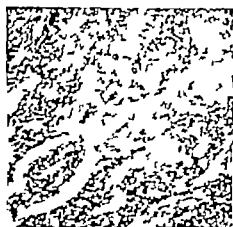
HELLER, C. G., LEWIS, H., and STERNBERG, A. E. L. Immature rat uterus as assay end point for gonadotropic substances. *Ann. J. Physiol.* 131: 244-278, Feb. 1923.



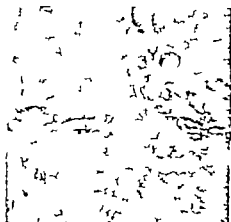
Normal



Patient 1



Patient 2



Patient 3

Figure 3—Biopsy sections contrasting the normal with those showing atrophic hyalinized tubules in a dense stroma of Leydig cells

rapid and simple and should be done in any patient suspected of having hypogonadism.

A history of mumps without orchitis was obtained in case 1, mumps with orchitis in case 2, and no mumps, trauma, or infectious process involving the testicles in case 3. All three patients had normal libido, erections, and ejaculations, and had had successful sexual intercourse. All three complained of easy fatigability, extreme nervousness, and inability to arouse easily in the morning.

Psychiatric evaluation on admission revealed that in case 1 the patient was dull, apathetic, and tremulous. He had been dismissed from school and from his previous job for disciplinary reasons. He was classified as having a personality defect with immaturity and emotional instability. The patient in case 2 had also been dismissed from school and was classified as having an inadequate, immature psycho-



pathic personality. The patient in case 3 had left school at the eighth grade because of lack of interest. He had many fears, and during the past year had noted excessive nervousness. He was classified as a schizoid personality. All three were nail biters.

The laboratory findings of significance were the low basal metabolic rate with normal blood cholesterol, low fasting blood sugar and flat glucose tolerance curve, increased urinary gonadotropins, and absence of spermatozoa (table 1).

TABLE 1.—Laboratory findings

	Patient 1 (Schizoid schizothym)	Patient 2 (Schizoid schizothym)	Patient 3 (Schizoid)
Urinary gonadotropins	Increased (100 M U.)	Increased (100 M U.)	Increased (100 M U.)
Sperm count	0	0	0
Urinary 17-ketosteroids	10 to 30 mg/24 hr	10 to 30 mg/24 hr	6 mg/24 hr
Testicular biopsy	Atrophic tubules	Atrophic tubules	Atrophic tubules
Average basal metabolic rate	Decrease 1.5% day cell stream —27	Decrease 1.5% day cell stream —28	Decrease 1.5% day cell stream —32
Fasting blood sugar	45 mg	55 mg	45 mg
Average blood cholesterol	10 mg	115 mg	145 mg
Blood sugar			
Fasting	45 mg	70 mg	65 mg
After 100 grams glucose	60 mg	81 mg	81 mg
Bone age	Normal	Normal	Normal
Berthel's thoracic phosphorus	1 mg	2 mg	4.6 mg
Carotidling lymphocytes			
Before treatment	1,500/cu mm	2,400/cu mm	2,400/cu mm
During testosterone therapy	2,300/cu mm	2,300/cu mm	2,400/cu mm

It is of interest that patient 1 was first given a course of desiccated thyroid, 120 mg. daily which in no way altered his condition or changed his basal metabolic rate. All three patients were eventually treated with testosterone first parenterally and then by sublingual or buccal pouch administration. No increased effectiveness was noted with the parenteral administration and the buccal pouch was used because of its simplicity. Little change was noted by laboratory tests, but the patients were subjectively greatly improved. All three remarked on the ease with which they could arise in the morning; they stated that they felt generally more alive and were capable of a much greater work output. Their nervousness decreased, and they were more useful around the ward. Disciplinary infractions were greatly decreased. Psychiatric reevaluation after a month of therapy showed definite general personality improvement in two of the patients, and a decrease in nervousness in the third.

The basal metabolic rate rose to normal levels in patient 2 when 100 mg. of testosterone propionate daily was given, and in patient 1 when 50 mg. daily was given. Although more frequent erections occurred on the higher dosage in none did these symptoms become distressing. Later when the patients were started on sublingual tes-

tosterone with an initial dosage of 18 mg daily all three complained of nearly continual erections. With a reduction of dosage to 12 mg daily this ceased. Although this amount did not bring the basal metabolic rate up to normal, nor apparently affect the sleeping pulse to any degree, it achieved the desired effect subjectively. All patients improved remarkably. They were more alert and energetic. They stated that they felt stronger and had more stamina. Regardless of the dosage or route of administration the blood sugar curves remained flat in the three patients, and the urinary gonadotropins remained above normal.

The differentiation of primary hypogonadism, or direct impairment of testicular function from secondary hypogonadism resulting from pituitary dysfunction, can be established by both clinical and laboratory findings. The pituitary (secondary) hypogonadal patient has a generalized adolescent development: no gynecomastia is present; voice, beard and pubic hair are of a preadolescent type; the testes and penis are small; the prostate is small or absent; and the bone development is retarded as shown by open epiphyses. In primary hypogonadism which occurs after or during puberty the sex characteristics are of adult type: there is usually gynecomastia; the voice is normal; the beard may be scant; chest hair is usually absent; but there is normal adult pubic hair; the testes are small and atrophic; but the penis is of normal size; the prostate is within normal limits; and the bone development is not retarded.

In primary hypogonadism (in the castrate or in testicular failure) an increased urinary gonadotropin is present. In secondary hypogonadism (the pituitary insufficiency type of hypogonadism) there is a decreased urinary gonadotropin. Testicular biopsy in these two types will also show typical differences: in primary testicular failure there is absence of all tubular cellular elements (germinal epithelium and Sertoli cell); whereas in the secondary or pituitary failure, immature germinal elements are present in the testes.

#### CASE REPORTS

*Case 1*—A 22-year-old unmarried white man was seen in December 1918 because of a sprained ankle. In the course of a routine physical examination it was discovered that the patient had bilateral gynecomastia and atrophic testicles. He had mumps without orchitis at the age of 9. At 11 years of age bilateral tenderness and swelling of the breasts were first noted; this tenderness persisted until the age of 17.

Pubic hair appeared at the usual age. Libido was normal and there had been no difficulty in obtaining erection or accomplishing ejaculation. He had sexual intercourse first at the age of 15. He

began to shave at 23 years of age and now shaves once a week. He had noticed that in the last 3 or 4 years he tired and became cold easily and required more blankets than other people. He perspired freely no dryness of the skin had been noted. For the past 4 years he has had considerable tremor of the hands.

There was no family history of endocrinopathy.

Examination on admission revealed a well-developed white man. The arm span was not significantly greater than the height. The beard was sparse and pubic hair was abundant and although there was no chest hair the general distribution was within normal male limits. The fingernails were bitten to the quick. The breasts were enlarged, nontender and female in type. The penis, scrotum, and prostate were well developed. The testes were small and about 14 cm. in diameter. There was no tenderness on pressure of the right testis and only slight tenderness on the left.

Roentgenograms showed normal bone age. Urinalysis and complete blood count were normal.

The patient was first given a 6-week course of desiccated thyroid, 120 mg. daily without any effect on his basal metabolic rate or his symptoms except to increase his nervousness. Testosterone propionate was then prescribed and he noted almost immediate decrease in nervousness, felt more energetic, his stamina increased, and he began to help with the ward chores without urging. Although he previously refused to be aroused in the morning in spite of disciplinary action, he now arose early of his own accord. With this personality change there was a moderate increase in basal metabolic rate.

*Case 2*—A 19-year-old unmarried white man was first seen in February 1949 complaining of pain and tenderness of the left breast which he first experienced 2 years previously. Intermittent tenderness and occasional episodes of swelling had been experienced during this period. All symptoms had been confined to the left breast. The onset of puberty and the development of pubic hair and other secondary sex characteristics occurred at about the usual age. Libido was normal and he had no difficulty in obtaining an erection or accomplishing ejaculation. Sexual intercourse first occurred at the age of 15. There was no history of heat or cold intolerance. He had mumps and orchitis at the age of 5. Family history revealed no evidence of endocrinopathy.

Physical examination revealed a well-developed white man who did not appear ill. The arm span was 3 inches more than the height. Facial hair was absent. Axillary and pubic hair was sparse but within normal limits. There was no chest hair. The fingernails

were bitten to the quick. The breasts were slightly enlarged with palpable glandular tissue the left breast was moderately tender. The penis, scrotum, and prostate were well developed. The right testis was just barely palpable, the left was approximately the size of a pea and nontender. Roentgenograms revealed normal bone age.

Routine laboratory examinations were normal.

During therapy with as much as 100 mg testosterone propionate daily the main change noted was an increase in the basal metabolic rate. This patient, whose personality deviation was more definite than in case 1 did not respond entirely to therapy but did become more stable and was easier to manage.

*Case 3*—A 20 year-old unmarried white man was first seen in April 1949 complaining of spells of "blacking out." He was seen on the neuropsychiatric service and a diagnosis of a severe anxiety neurosis was made. He was referred to the endocrine clinic because of small testes. He had always had small testes and had been weak and of slight build. He had normal libido, erections, and ejaculations and first had intercourse at the age of 18. He shaved twice a week. He had never had mammary swelling or soreness. He always has had some intolerance to cold, easy fatigability and difficulty in being aroused in the morning. Past history revealed no evidence of mumps or any testicular trauma.

Examination on admission revealed a poorly developed asthenic white man appearing extremely nervous and apprehensive. The beard was practically absent and the distribution of pubic hair tended toward the female type. Axillary hair was sparse. There was no chest hair. A mild gynecomastia was present bilaterally. Both testes were atrophic about 1 cm. in diameter and only slightly tender to pressure. The penis and scrotum were well developed. The prostate was small but within normal limits. No prostatic secretion was present.

Roentgenograms revealed normal bone age.

The response to therapy was dramatic and a very definite personality disturbance was alleviated.

#### SUMMARY

Three cases of a syndrome characterized by aspermatogenesis without the absence of androgen secretion of the interstitial cells of Leydig and increased urinary gonadotropins have been presented. Because of the relative lack of gynecomastia in the eunuchoid patient and the extreme gynecomastia in the patient with male body structure it is believed that the syndrome described by Klinefelter is not specific

and that these patients represent an incomplete eunuchoid state with body characteristics dependent on the degree and time of onset of failure. Testosterone therapy produces favorable results. In these three patients, testosterone administered sublingually or between the cheek and teeth produced clinical results equal to those from parenterally administered testosterone propionate. This similarity in response has not been observed in all patients with hypogonadism.



# Study of Five Hundred Autopsies in Cases of Tuberculosis

MERRILL C. DAVENPORT *Lieutenant Colonel M. C. S. A.*

HENRY M. GREENLEAF *Lieutenant Colonel M. C. S. A.*

FROM 1944 through 1947 9,388 patients with tuberculosis were admitted to this hospital. In the same period, there were 342 deaths from tuberculosis (all types). We were impressed with the fact that our clinical and autopsy material was not consistently demonstrating the extrapulmonary complications that we had been led to expect and that was one reason for undertaking this study. The same senior pathologist supervised the autopsies throughout the period covered by this report. The material consists of 500 consecutive autopsy reports of male patients who died with a primary diagnosis of pulmonary tuberculosis confirmed by the pathologist. No patients who died of other causes or in whom tuberculosis was reported as an incidental finding were included. Patients in whom the primary cause of death was nonpulmonary tuberculosis are included if pulmonary tuberculosis was also present.

Clinical charts were used only for recording the age of the patient at the time of death and for determining the duration of the disease from the first symptoms referable to tuberculosis to the time of death.

Although this period is difficult to fix, and depends on the skill and conscientiousness of the many clinicians concerned, it is believed that the accuracy in recording the onset in these patients was as good or better than average. Practically all patients had their onset while in the Federal service, a fact that could be accurately checked by the induction chest roentgenogram in most cases. We believe that the rigors of active duty and the availability of medical observation and laboratory facilities made early detection and diagnosis possible in most of the patient.

The limitations inherent in such a study lay in the fact that (a) the patients were all men 17 years or more of age, (b) the limitation of this

hospital is primarily that of a clearing house for diagnosis, initiating treatment providing surgical treatment where indicated, and then arranging for sanatorium or home care elsewhere (c) the changing staff of assistant pathologists altered the reported autopsy findings to some extent despite the supervision by the same chief pathologist and (d) from 1930 to 1942 inclusive the cranium was usually opened for examination only when intracranial tuberculosis was suspected clinically

### MATERIAL

*Race*—Of the 500 cases studied, 369 patients were white, 123 were Negroes, and 8 were Indians.

*Age*—Although the average age for the entire series was 3.1 years, only 99 were in the 30- to 39 years age group, 224 were below 30 years, and 177 were above 40. The oldest patient was 77 and the youngest was 18 years old. Further distribution is given in table 1.

TABLE 1—Distribution by age groups

Age in years	Number in 1930-42	Number in 1943-47	Total
Under 20		4	12
20 to 29	95	122	217
30 to 39	36	36	72
40 to 49	36	12	48
Over 50	36	13	49
Total	239	170	409

*Extent and type of pulmonary involvement*—Eight cases were moderately advanced and 493 were far advanced. A mixed pulmonary lesion was found in 433, solitary involvement was found in 11, nodose involvement in 4, and pneumonic involvement in 2. Cavitation was found in 433.

*Duration of infection* is shown in table 2. The longest duration in a white patient was 26 years and in a Negro patient 25 years, the shortest was 1 month for both white and Negro patients. The average duration for white patients was 4 years and 6 months but for Negroes was only 1 year and 7 months. In this computation we excluded two atypical cases, the white patient with a duration of 26 years and the

A large percent of the patients dying at this hospital were acutely ill young adults and smaller number were veterans of World War I whose disease was chronic and who came to this hospital to die. Immediately after the cessation of hostilities men primarily of war with active and disease secondary to terrible privation who were admitted died. An increase in the number of Negro patients resulting from the increased percent of Negro troops in the service in World War II accounted for another large group of terminal cases.

The prevalence of tuberculous, solitary or nodular involvement within the skull did not, however, show appreciable change in the period from 1943 to 1947 when the brain was examined in every instance.

Negro with a duration of 28 years. Of 355 patients who had their illness less than 3 years, 220 were under 30 years of age. Forty-six died in less than 6 months after the onset of symptoms. Of the 429 patients who had their illness less than 10 years, 80 were over 40 years of age.

TABLE 2 — *Duration of infection*

	Number
Less than 1 year	209
1 to 2 years	146
3 to 4 years	83
5 to 9 years	41
Over 10 years	71
Total number	500
Longest duration	
White	26 years
Negro	28 years
Shortest duration	
White	1 month.
Negro	1 month.
Average duration for the group	4 years and 6 months.
Average duration for Negroes	1 year and 7 months.

## FINDINGS

The complications found in this series are shown in table 3. Pleurisy, pleural effusion, pleural adhesions, bronchopleural fistulas and bronchocutaneous fistulas were not recorded. Generalized or specific organ wasting or atrophy was not considered a complication. Simple atrophy of endocrine glands was of interest but was not recorded because of the difficulty of establishing an adequate line of demarcation between the normal and the abnormal. Paranasal sinus and tonsillar involvement were not recorded, because sinuses were not examined and tonsils, if present, were not sectioned routinely.

*Pulmonary hemorrhage* was listed as a terminal complication only when it was believed to be the immediate cause of death either by exsanguination or suffocation. The finding of gross blood is not positive proof of death by hemorrhage. Such hemorrhage was found in 54 patients; only 2 of these showed no cavitation. Thirteen of the 54 were Negroes. The average age at death associated with hemorrhage was 35.9 years, and the average duration of the disease at death was 4 years and 9 months. The longest duration of the disease at time of hemorrhage and death was 26 years and the shortest was 2 months. The oldest patient at time of hemorrhage and death was 65 and the youngest was 10 years of age. Because Negroes made up 24 percent of those who died with hemorrhage and 24 percent of the whole series



this complication did not appear more frequently among the Negroes in our series than among the white patients. The average duration of the disease at time of death, associated with hemorrhage was about the same as the duration for the group as a whole.

TABLE 3.—Complications found at autopsy

Complication	Number
Gastrointestinal tract	250
Liver	223
Spleen	209
Lymph glands (other than hilar)	208
Kidney	146
Larynx	132
Clubbing of fingers	110
Genital organs	79
Adrenal glands	70
Peritoneum	69
Trachea	68
Central nervous system	51
Tuberculosis	15
Meningitis	34
Other	2
Amyloidosis	36
Thyroid	23
Bones	21
Pericardium	17
Pancreas	9
Myocardium	9
Ear	8
Skin (other than around fistula)	4

*Empyema* was considered to be present only in those cases in which frank pus was found in the pleural cavity at autopsy. One hundred and four cases showed this complication. The longest duration of disease in this group was 21 years, and the shortest 2 months (average 3 years and 8 months). Forty-five of these had not had collapse therapy. 38 had received pneumoperitoneum or pneumothorax and 1 had had thoracoplasty.

*Cor pulmonale* was a terminal or contributory cause of death in many patients. Although it was difficult to establish criteria for such a diagnosis from the autopsy reports, dilatation of the right side of the heart or hypertrophy was present in about 703 patients.

*Extrapulmonary tuberculous involvement*—No extrapulmonary involvement of any kind, including clubbing of the fingers and amyloidosis, was found in 54 patients. In this group the average age was higher than that of the group as a whole. The oldest was 67 and the youngest 20 years old. Sixteen were below 40 and 24 were above 40 years of age. The incidence of extrapulmonary tuberculous

involvement is shown in table 3. In the 146 patients with renal involvement 11 had involvement of both kidneys.

### CORRELATIONS

Correlation of the more prevalent complications with the duration of the disease is shown in table 4. An appreciable number (22 per cent) of complications was present in that portion of the group with a duration of less than 1 year who died in less than 6 months. Almost all of the patients who died within the first 3 years after onset of the disease were within the group 20 to 35 years of age and those who had had symptoms for 10 years or more before death were over 50 years of age. The percentage of gastrointestinal liver spleen and lymph gland involvement in the cases of less than 3 years duration was high. Ear involvement was significantly greater in the cases of short duration. Clubbing of the fingers had little relation to the duration of the disease. Amyloidosis was found in the cases of longer duration. Correlation of the extrapulmonary complications with chronologic age at the time of death is shown in table 5.

TABLE 4.—Correlation of complications with disease duration

Duration ( years	Less than 1	1 to 2	3 to 4	5 to 9	Over 10	Total
	PERCENT					
<b>COMPLICATIONS</b>						
Gastrointestinal tract	36.3	51.3	33.3	40.4	37.5	39.6
Liver	35.8	41.6	36.1	33.8	27.7	41.4
Spleen	33.3	40.3	33.3	35.1	33.6	41.6
Lymph glands (other than hilar)	36.4	36.1	33.3	34	33.3	41.6
Kidney	22.4	21.8	23.0	25.1	30.5	25.2
Larynx	31.5	27.0	24.4	11.9	12.5	25.4
Clubbing of fingers	21	25.0	19.4	14.0	31.8	22
Genital organs	14.0	20.1	22.2	14.2	15.2	17.6
Adrenal glands	15.8	13.1	4.5	11.2	11.2	11.6
Peritoneum	1.9	13.9	11.1	4	4.1	13.9
Trachea	14.5	15.8	11.1	11.9	6.9	13.6
Central nervous system						
Tuberculosis	4.3	2.7	2.7	2.8	0.6	3.6
Meningitis	7.7	9.6	8.3	4.7	2.1	6.7
Amyloidosis	3.3	2.4	1.4	14	15.2	1
Thyroid gland	4.3	5.1	11.1	4.7	2.7	6.2
None	5.3	2.7	5.5	4	7	4.2
Pericardium	4.3	2	6	2.3	3	4.4
Heart	1.9	1.3	2.7	0	2	1
Myocardium	1.4	2	5.5	6.0	1.3	1
Ear	2.9	1.3	0.6	0.0	6.0	1.7

Sixty-seven patients showed no evidence of pulmonary cavitation. Of this group, 13 had no evidence of extrapulmonary involvement. Thus, about the same proportion showed no evidence of extrapulmonary involvement as for the total group of 500 patients. Although the presence or absence of pulmonary cavitation made no significant difference in the incidence of extrapulmonary complication the nature of the complications was altered as shown in figure 1.

TABLE 5.—Correlation of complications with age at time of death

Age in years	Under 20	20 to 29	30 to 39	40 to 49	Over 50	Total
	PERCENT					
COMPLICATION						
Gastrointestinal tract	14	42	47	41.1	24	38
Liver	30.0	34.2	44	27.7	22.7	44
Spleen	30	30	42	28	21.0	41
Lymph glands (other than hilar)	41	49	30	42	12	41.6
Kidney	14	26	26	30.3	22.0	29.2
Larynx	41.6	22	24	24.3	10.3	26.4
Clubbing of fingers	23	22	22	12.6	41	22
Genital organs	23		27	3.1	12	13
Adrenal glands	14.6		12	12	12	14
Peritoneum	14	19	9	4	10.3	12.6
Trachea	2.3	26	1	7.6	12.7	12.6
Central nervous system						
Tuberculosis	0.3	3.7	4	0	1.7	3
Meningitis	0.3	6.8	7	4	0	6
Amyloidosis	0	3.7	8	20	12.7	7
Thyroid gland	0.0	7	3	1		
Bone	2.3	4.6	3	2.3	2	2
Pericardium	0.3	1.6	4	2	5	3.4
Pancreas	0.0	2.3	1	1.2		0
Myocardium	0.0	2.3	1	2		0
Skin	0.0	2.8		0.0		

Involvement of the liver, spleen, kidneys, pancreas, thyroid, adrenals, genital organs, central nervous system, myocardium, pharynx, and bone is thus shown to be relatively more frequent in those with pulmonary cavitation than in the entire series, while involvement of the gastrointestinal tract, lymph glands, larynx, fingers, and trachea was less frequent and involvement of the peritoneum, pericardium, skin, and amyloid formation was little altered.

TABLE 6.—Percent of patient with empyema compared with clubbing of fingers, bone involvement, and amyloidosis

	Percent of 104 patients with empyema	Percent of 294 patients without empyema	Percent of entire series
Clubbing of fingers	23.0	21.0	22
Bone involvement		0	
Amyloidosis	1	4.3	

Of 104 patients with empyema 24 had clubbing of fingers, 15 had amyloidosis, and 5 had bone involvement (table 6). Clubbing of fingers and bone involvement appear to have no relation to empyema, but the incidence of amyloidosis is definitely increased in the presence of this complication. Amyloidosis seems to have almost disappeared as a complication of pulmonary tuberculosis. Although in the first 200 patients who died between 1939 and 1943, 35 had amyloidosis, in the next 210 patients who died between 1944 and 1951 this complication was found in only 1 despite diligent search. The only explanation that appears likely is that the last part of the series contained a large number of young patients with fulminating disease of short duration.

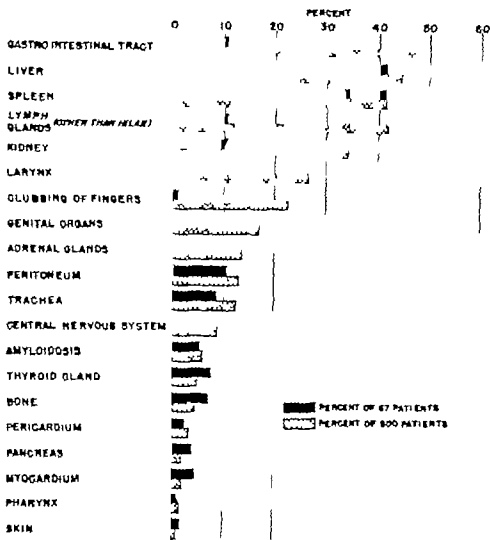


Figure 1—Incidence of complications in patients without pulmonary cavitation and in entire series

Of 158 patients with involvement of the larynx and or trachea, 51 had involvement of both and 118 had involvement of the gastrointestinal tract as well. There appears to be a significant correlation of these complications, a fact which is probably associated with the presence of positive sputum.

Of 222 patients with liver involvement 187 had involvement of the spleen, 116 had renal involvement and 50 had involvement of the adrenals as well as compared with 14 percent for the entire series. One hundred and nine had involvement of the spleen liver and kidneys. Hematogenous spread appeared to have a predilection for the liver spleen renal and adrenal tissue in that order. The kidneys were diseased in 30 the spleen in 22, and the adrenal glands in 14

patients without hepatic involvement. Of 60 patients with peritonitis, 61 were associated with gastrointestinal tuberculosis.

### DISCUSSION

The figures presented are probably weighted with acute fulminating infections in a group whose general resistance was low as revealed by the large number of cases of short duration. Inasmuch as the reported tissue involvement is based entirely on autopsy findings the fact that 50 percent had lesions in the gastrointestinal tract by no means indicates that this number complained of gastrointestinal symptoms. Although the liver contained tubercles in 44.4 percent of patients, it is doubtful that any known liver function test would have revealed impaired hepatic function in any of these patients.

Our findings support those of Pinner (1) who states

"The vast majority of infection is by the aerogenous route.

Ghon and Kudlich reported in 1930 the primary complexes in over 2,000 cases. The lung was the site of primary infection in 90 percent of the cases, the intestinal tract in 1.14 percent, the skin in 0.14 percent, nose, tonsils, parotid gland, middle ear and conjunctiva, each in less than 0.1 percent.

"Evidence of hematogenous spread can frequently be found particularly in the terminal phases, but if present, such spread is, as a rule, clinically insignificant and most often demonstrable only by microscopic or bacteriological study."

Aronson (2) points out that the military death rates cannot be properly compared with those for civilians. The death rate for tuberculosis in the Army is about 7 per 100,000 as compared with 48 per 100,000 for the United States as a whole. The number of deaths by age groups is weighted by the preponderance of men between 20 and 30 years old in the Army. Aronson shows an even greater preponderance in this age group than we do, probably because of our pre- and post war load of veterans of World War I and the fact that his figures probably included young patients too ill to be transferred to Fitzsimons Army Hospital from the various station hospitals. By means of comparing death rates for tuberculosis with average age distribution for the Army as a whole, he determined that the death rates in the Army increase with age in a manner similar to that seen in the civil population. Forty three percent of his patients were Negroes as compared with 24 percent of ours. From this we may surmise that many of his Negro patients died before they could be transferred to this hospital. The percent of Indians in his series was 2, almost identical with ours. We agree with his statement "There was no sharp racial variation in the percentage of deaths at different ages."

There is little uniformity in the literature regarding the duration of symptoms. Rogers (3) found that the mean duration of tuberculosis was 18 months for Negro and 18 months for white patients. Opie (4) observed that among Negroes living in Jamaica the duration of tuberculosis for those between 15 and 30 years of age averaged 9 months, while for a group of white patients of comparable age in Philadelphia it averaged 28 months. Pinner and Kasper (5) found that tuberculosis averaged 33.2 months for 96 whites and 10.8 months for 47 Negro patients. Aronson found the average for white to be 57 months, while that for the Negro patients was 6.1 months. His explanation for his disagreement with other writers was the probability that his cases were of a more acute type. Our average durations of 4 years and 6 months for white and 1 year and 7 months for Negro patients do not seem unreasonable in view of the nature of the group studied. Rubin (6) supports our impression that it is difficult to state what degree of hematogenous spread constitutes classic miliary tuberculosis. He classifies hematogenous spread as miliary generalized acute, gradual slow or intermittent seeding.

*Empyema* as a complication of pulmonary tuberculosis is well covered in the literature. We found nothing startling about the incidence of this complication.

*Pulmonary hemorrhage* as a cause of death in phthisis is generally minimized. Pinner (1) states "Only a very small percentage of hemorrhages are immediately fatal by exsanguination or asphyxia. \* \* \* Sudden death during hemorrhage is more often caused by asphyxiation than exsanguination." Our findings of hemorrhage as the immediate cause of death in 10.8 percent of the patients suggests that this complication is more serious than has been supposed.

*Cor pulmonale* as a complication of pulmonary tuberculosis was studied by Kuruner and Webb (8). Their material was drawn from the present series of 100 patients. They agreed with others as to the frequency of emphysema and fibrosis in chronic *cor pulmonale* in tuberculosis.

*Tuberculous dissemination*—Rich (9) drew attention to the difference in the degree of involvement of different tissues by *Mycobacterium tuberculosis*. He stated

"In the human being progressive destructive lesions arising in the tissue in question (i. e., lesions not resulting from extension by direct continuity from contiguous susceptible organs) are familiar for example in the lung, kidney, intestine, fallopian tube, epididymus, prostate, adrenal, bone, brain, skin, eye and lymph nodes. They are rare however in the skeletal muscles, pancreas, thyroid, heart, liver, spleen, ovary and testis."

According to Myerson "the incidence of laryngeal tuberculosis varies with almost every writer" ranging from 1.2 to 9.4 percent with an average of 14 percent. He found the highest incidence in the group between 20 and 40 years of age. Lederer (quoted by Goldberg) and Myerson (14) stated that the frequency of involvement increases with the duration of the pulmonary disease to which it is almost invariably secondary. In our series there is a definite correlation between laryngeal tuberculosis and pulmonary cavitation, and also between laryngeal and intestinal tuberculosis which was also present in a higher percent in the patients with cavitation. Myerson reported tracheobronchial tuberculosis in 4 percent of all tuberculous patients with women outnumbering men 3 to 1. In our series (all men) 14 percent had this complication.

*Genitourinary tract*—McKenna (quoted by Goldberg (10)) points out that the incidence of genitourinary tuberculosis depends on the type of patient. He quotes Hubner as finding that 3 to 5 percent of patients with pulmonary tuberculosis have this complication; however it is found in from 50 to 100 percent of those with extrapulmonary tuberculosis. Our findings of kidney involvement in 29.2 percent and genital involvement in 15 percent indicate that such lesions are commoner than is generally believed. Aronson found an incidence of 39.4 percent with kidney involvement and 30 percent with genital involvement among deaths from tuberculosis of all types. The hematogenous route is primarily implicated in the spread and the highest incidence of urogenital tuberculosis is found in patients 20 to 50 years of age. The duration of the infection seemed to have little effect on the incidence of this complication.

*Endocrine gland*—Aronson found tuberculosis of the thyroid in 2.9 percent of his tuberculous patients at autopsy. Our percent may have resulted from terminal hematogenous spread. Although Addison's disease is rare among patients with pulmonary tuberculosis, adrenal involvement may be an important factor in the terminal course of such patients (15). Aronson found such involvement in 2.1 percent of his series. We found tuberculosis of one or both adrenals in 14 percent of our series. We did not find any case of tuberculosis of the pituitary body.

*Liver, spleen, and pancreas*.—Because the liver and spleen are seldom mentioned in the literature on tuberculosis, our finding of 44 and 41 percent involvement respectively was surprising. Aronson, in his series, found 65 percent involvement of both. The involvement usually consisted of miliary tubercles which suggests a terminal or near terminal hematogenous spread of little clinical significance. The pancreas, renowned for its resistance to tuberculosis was found to contain tubercles in 1.5 percent of our series.

*Central nervous system.*—Although tuberculomas and tuberculous meningitis are extensively covered in the literature most statistics include infants and children and cannot properly be compared with our findings. Furthermore most studies have been based on total deaths from tuberculosis rather than deaths with a primary or apparently primary pulmonary infection. Aronson found cerebral tuberculosis in 12 percent and meningitis in 36 percent of his series.

*Bone tuberculosis* is usually reported in series that include children. Our finding of 4.2 percent with bone involvement compares favorably with that of Aronson (5.6 percent) although his series included a higher proportion of Negroes.

*Heart*—Although tuberculous pericarditis, according to authors quoted by Goldberg was found in 6.3 percent of 1780 autopsies on tuberculous patients, it was diagnosed in only 0.4 percent of 7646 collected cases. Aronson found it in 2.1 and we found it in 3.2 percent. Strauss (quoted by Goldberg) found that tuberculosis of the myocardium is rare varying from 2.64 percent in children to 0.33 percent in adults with tuberculosis who are examined at autopsy.

*Skin tuberculosis* is rare in America but internists are always on the lookout for cutaneous manifestations with pulmonary tuberculosis (16).

*Clubbing of the fingers* was found in 22 percent of our cases. According to Mendlowitz (17) clubbing is most pronounced in chronic suppurative conditions such as bronchiectasis and empyema and is seen less frequently in pulmonary tuberculosis, and then usually in protracted cases. Our observation of clubbing in many cases of short duration (22 percent in cases of less than 1 year's duration) was surprising. It is doubtful that hospitalization at a high altitude (Denver, Colo.) played any appreciable part in the development of this finding. The duration of the pulmonary disease seemed to have no appreciable effect but the incidence of clubbing reached 41 percent of those who died after attaining the age of 50 years, when bronchiectasis was probably more prevalent. There was no significant correlation between clubbing and empyema. We did not check the relation of clubbing with amyloidosis because of the small number of patients with amyloid disease.

*Amyloidosis*—Wassersug (18) states that chronic suppurative disease tuberculous or otherwise usually leads to amyloid disease. Although few of our patients were classed as chronic, we found 16 percent with amyloidosis among those who died after an infection of 3 years or more duration. The actual age made relatively little difference in the incidence other than to reflect the duration of the illness. Crawford and Sawyer working in this hospital studied a large group



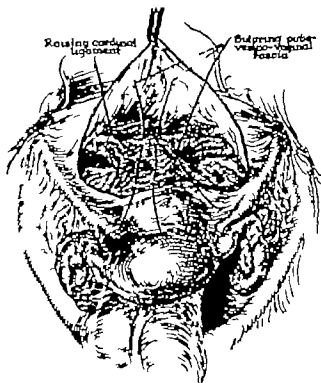


# Abdominal Hysteropexy for Uterine Prolapse

PAUL PETERSON, Captain MC U S A  
SIDNEY L. ARSE, Colonel MC U S A

THE literature is replete with various types of uterine suspension as well as methods for the correction of prolapse. Perhaps the most widely used procedures for prolapse during the childbearing period is the Manchester or Fothergill operation and various modifications of it. Although pregnancy and delivery do occur thereafter abortions and severe lacerations of the remaining cervix are complications to watch for. The main supports of the uterus are the structures which are encompassed by a plane about the cervix and upper vagina. It occurred to the senior author about 12 years ago that these supports could be strengthened by the abdominal approach without amputation of the cervix and that this would give a much better chance for normal pregnancy and delivery to follow. Therefore the following technic was developed and has proved satisfactory in such cases.

*Operation.*—The abdomen is opened through a midline incision and the uterus is lifted up with a ligature through the fundus. A silk ligature is then passed from outside the uterosacral ligament one-third to one-half the distance toward the sacrum. It then picks up the peritoneum and rectovaginal fascia in the cul-de-sac. If the fascia is badly stripped away it may be necessary to open the peritoneum in the cul-de-sac to locate and pick up the fascia in this area. The ligature is then passed through the back of the cervix near the vaginal reflection. It dips again to pick up the cul-de-sac as before and then passes out through the uterosacral ligament on the opposite side. The ligature is then tied. Another ligature is taken through the uterosacral ligaments and cervix above this one and tied. Thereafter ligatures are passed through one ligament, the cul-de-sac fascia and peritoneum

*Figure 1**Figure 2.*

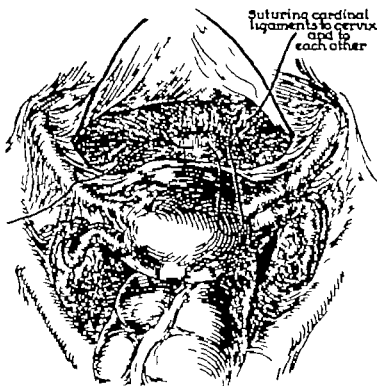


Figure 3

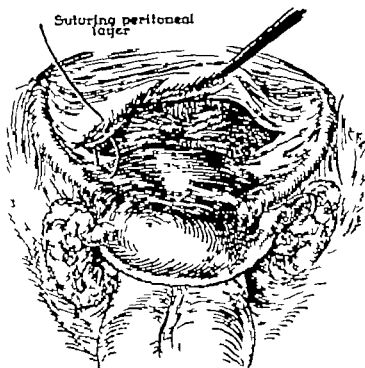


Figure 4

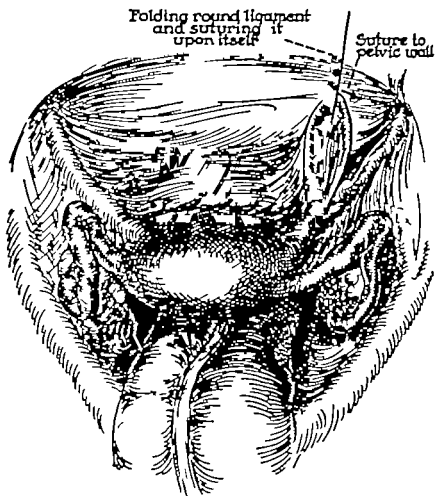


Figure 1.

out through the opposite uterosacral ligament, and tied. These ligatures are continued every one-fourth inch back to the front of the rectum and made snug around it to help maintain the lift which has been given to it by bringing up the fascia (fig 1). The uterus is then held toward the patient's head and the bladder flap is depressed to a level below the tip of the cervix. The pubovesicocervical fascia can be visualized and usually the rent in it stands out well. Silk is used to place a suture through the edges of the rent and to anchor it to the cervix at the uterocervical juncture. Sufficient sutures are placed to close the rent and to anchor the fascia to the cervix wall (fig 2). The cardinal ligaments are picked up near the cervix with Allis forceps and the relaxation noted. These are then sutured to the cervix and to each other at the uterocervical juncture and downward on the

cervix, placing sutures through fascia and cervix and bringing the ligaments together. This forms a sling across the front of the cervix to give good support as well as proper tilt to the fundus (figs. 3 and 4). The fascial repair obliterates the cystocele. The bladder is then placed at a slightly higher level than formerly as the fascial repair has definitely lifted it up. Plain catgut is used to fix the bladder in place. Silk sutures are used to triplicate the round ligaments on themselves (fig. 5). The suture through the outer "knuckle" catches the fascia at the internal ring as well as the distal part of the round ligament, whereas the medial "knuckle" is anchored well into the body of the round ligament. The abdomen is closed in layers.

*Danger points*—(1) When picking up the uterosacral ligaments from the back, watch for low placed ureters caused by lower position of the bladder. (2) Anteriorly when picking up the cardinal ligaments insert the needle through them parallel to the course of the ureter, being careful to stay medial to it. (3) When triplicating the round ligaments, be sure no holes are left through which a piece of bowel may work its way.

#### DISCUSSION

It may be seen from the preceding that this procedure will correct the prolapse and associated cystocele and rectocele. It does not correct gaping of the vaginal orifice nor the defect in the pelvic floor which exists concomitantly in many of these cases. If any one of these three conditions is associated with the prolapse it has to be corrected from below. If the elongated cervix is amputated it is only a partial amputation and is not fraught with the same dangers as the Manchester procedure. This complication is seldom seen as the prolapse is not usually neglected sufficiently to allow it to develop. In half of the patients with prolapse today the pelvic floor and introitus have been adequately repaired following delivery and, therefore only the abdominal procedure need be carried out. This procedure has been carried out successfully in two virgins with third degree prolapse.





# Application of Civil Defense Lessons Learned in World War II<sup>1</sup>

WILLIAM L. WILSON (Colonel MC U S A.)

WHAT is to be said here is not officially proposed as a guide—it must not be construed in any manner to have military or other governmental sanction or approval. It does not convey official decision or policy; this applies especially to the suggested applications of the lessons which are solely my own responsibility. This subject has so many possibilities that it has not been easy to outline, or direct into an application of past experience; the lessons we should have learned. I shall explore this difficult subject by listing some of the lessons which were learned in World War II, examine them briefly and then consider the manner in which they might be applied to future planning. As we review them be reassured that a necessary stressing of the disasters of war in no wise predicts war soon or in the distant future.

## LESSONS

1. *The United States is probably the most changing and shifting nation in the world*—Like others, we have a population that is aging<sup>2</sup> although increasing rapidly. It has a larger proportion of women than men for the first time. Employment has adapted to industrialization at a rapid rate. This has accompanied urbanization (fig 1) and steadily decreasing agricultural employment until there are now 50 cities with more than 200,000 population, a minimum likely to be considered good atomic bomb targets.

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Condensation of a paper delivered 20 February 1940 before the Tenth Annual Congress on Industrial Health of the American Medical Association, New York, N. Y. The full text can be obtained from the Technical Information Office, Surgeon General's Office, Department of the Army.

Office of the Surgeon General, Department of the Army.  
WHEELER, P. K., ET AL. Forecast of the Population of the United States 1944-1975. United States Government Printing Office, Washington, D. C., 1941.

UNITED STATES HOUSE OF REPRESENTATIVES. Committee on the Problems of Changing Population. United States Government Printing Office, Washington, D. C., 1939.

FURMAN, B. Women to exceed men in 1930 census. The New York Times, New York, N. Y., Feb. 12, 1930, p. 23.

REED, L. J. Changing problems growing out of change in composition of population. Am. J. Pub. Health 38: 160-163, JAN. (pt. 1) 1948.



A quick look at our past may indicate some of the problems of the future. For example, in the recent war we had a voluntary migration which caused great difficulty in furnishing health services at home. We may visualize major problems in administration of governmental, industrial, and voluntary health services, when more than half of our population is mobile. In the 7 year period 1939-46, 70 million of our people moved from one house to another at least once. Of those who moved, half moved to a different State. Thirty percent of our 14 million World War II veterans moved in 1947. Our West

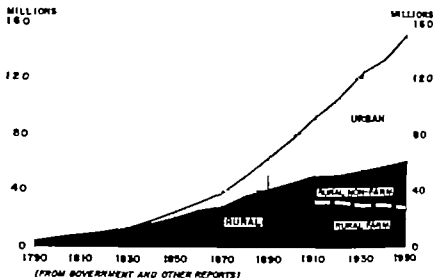


Figure 1—Population changes in the United States by residence areas and time periods.

ern States nearly doubled their population while those in the East and the Midwest had losses. Most of this accompanied occupational, vocational, or economic relocation in adjustment to a shifting of industry and industrial facilities. During the war there was a pronounced shifting in type and volume of production to items for military use.

During and since the recent war statistics have purported to prove widespread physical unfitness, critical health hazards, inadequate health services, or excessive wastes of medical means incident to the war. Although a maximum number of our physicians was with the

BLANKENSHIP, C. F. and KAPFER, F. A Study of Medical Problems Associated With Transients. United States Public Health Service Bulletin No. 238, United States Government Printing Office, Washington, D. C., 1948.

Harvey of the Census, Department of Commerce. Current Population Report, Series P 26, No. 14. Internal Migration of the United States, April 1940 to April 1947. Department of Commerce, Washington, D. C., Apr. 18, 1948.

armed forces in 1915 when 60,721 (31.4 percent of total) were on duty.<sup>9</sup> American community health and necessary medical services survived the war with remarkable success in this country.<sup>10</sup> At the same time the armed forces and occupied areas had the best medical services in history. The furnishing of health services to such a mobile civil population in this country has not, however, been directly hampered by enemy action in the past. If we add the possibilities of enemy action against our civilians, we realize that our efforts will be inadequate unless future obligations are met in a more energetic, intelligent, and integrated manner than ever has been known. During World War II our lack of coordination of medical activities and confusion in integrating administration of military and civilian health affairs was so complex it can be shown best by diagrams (figs. 2 and 3).

What were some achievements of American medicine in World War II? After 7 years beginning with 1940 only 5 percent of all live births were unattended by physicians. Live births occurring in hospitals increased by 46 percent. Infant mortality rates dropped by 25 and maternal mortality rates by more than 50 percent. During this critical period the number of nurses consistently increased in United States hospitals by nearly 35 percent. While unexcelled medical and nursing attendance was being rendered 14 million in our armed services throughout the world mortality at home was decreasing as was morbidity from communicable and other diseases. Army medical officers away from the United States have recently supervised the re-establishing of health services for 140 millions in Europe,<sup>11</sup> for 80 million Japanese, and for the inhabitants of the Philippines and Korea. They also supervised the health of 16 million migrants from 33 countries as the latter resettled in Europe before 1947 as well as 6 million Japanese during repatriation from 19 Asiatic Pacific areas.

In view of the facts cited, it might be advantageous to an enemy to direct his weapons at our industrial installations rather than at our armed forces.<sup>12</sup> With this in mind the National Security Resources Board has proposed maximum practicable dispersion of industry. The strategic significance of industrial plant location in the event of

<sup>9</sup> Personnel and Administration, General Staff Department of the Army. But called by common location dated 27 October 1915.

<sup>10</sup> Wilson, W. L. The Value of the Physician in War. Address before American County Medical Society Golden City, Mo. Mar. 28, 1949.

<sup>11</sup> Supreme Headquarters, Allied Expeditionary Force. Technical Manual for Public Health Officers, Ministry Government for Germany. Feb. 1945.

<sup>12</sup> Maxson, E. R. American Security and Access to Raw Materials. World Politics 1 (2): 147 Jan. 1940.

<sup>13</sup> National Security Resources Board. National Security Factors of Industrial Location. United States Government Printing Office. Washington, D. C., Sept. 1945.

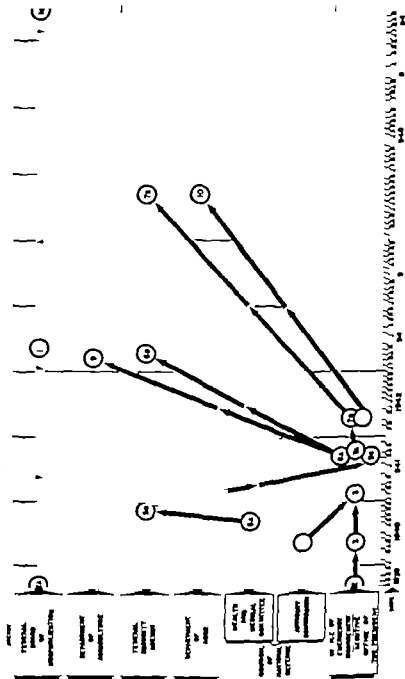


Figure 2.—Coordination of medical efforts—general organization.

The following is supplemental to the chart on the opposite page

1. Federal Board of Hospitalization

a. Organized 1 November 1921 to coordinate hospitalization activities of the Army Navy Public Health Service, Veterans Administration, St. Elizabeths Hospital, and Office of Indian Affairs.

b. Designated advisory agency to the Bureau of the Budget by Budget Circular 419 May 1942.

c. Terminated 30 June 1948 by letters from the Director Bureau of the Budget to members of the Board, dated 28 May 1948.

2. Executive Order 8248 8 September 1939 authorized establishment of an office for emergency management.

3. Administrative order of the President 25 May 1940, set up office for emergency management in the Executive Office of the President (page 2100 Federal Register of 4 June 1940) contained only Office of Defense Transportation and the Philippine Alien Property Administration on 30 June 1940, former to terminate 29 February 1940.

4. Advisory Commission of the Council of National Defense set up 29 May 1940 funds available thereto reallocated to the Office for Emergency Management by the President, 28 February 1941.

5. Health and Medical Committee

a. Of the Council of National Defense, established 10 September 1940.

1. On order of the Council of National Defense approved by the President 28 November 1940 transferred to Federal Security Agency

Transferred to Office of Defense Health and Welfare Services Office for Emergency Management Executive Office of the President by section 6, Executive Order 8800 3 September 1941.

6. Office of Defense Health and Welfare Services

a. Established in the Office for Emergency Management, Executive Office of the President by Executive Order 8800 3 September 1941 to coordinate all health, medical, welfare nutrition, recreation, and other related activities affecting the national defense, including those aspects of education under the Federal Security Agency

b. Abolished by Executive Order 9338 29 April 1943 and all functions transferred to Federal Security Agency

7a. The President's approval of a letter of 30 October 1941 from the Administrator Federal Security Agency established the Procurement and Assignment Agency in the Defense Health and Welfare Services.

b. Procurement and Assignment (office) transferred to War Manpower Commission by section 4, Executive Order 9179 18 April 1942.

8. War Manpower Commission established in the Office for Emergency Management by Executive Order 9139 18 April 1942, to assure most effective mobilization and utilization of manpower for war

9. By Executive Order 9150 3 March 1943, functions, powers and duties with respect to nutrition transferred from the Office of Defense Health and Welfare Services to the Secretary of Agriculture.

10. War Manpower Commission terminated by Executive Order 901 19 September 1943, and all functions transferred to Department of Labor except procurement and assignment service (established as agency and transferred without official change of designation) which was transferred to the Federal Security Administration.



The following is supplemental to the chart on the opposite page

1. Office of Civilian Defense

a. Established in Office for Emergency Management by Executive Order 8700, 20 May 1941, amended by Executive Orders 8760, 20 June 1941 and 8822, 16 July 1941.

b. Amended by Executive Order 9134, 15 April 1942, which set up a civilian defense board.

c. Abolished by Executive Order 9302, 4 June 1943, effective 30 June 1943.

2. Surgeon General of the Army

a. Charged with administration of military hospitalization and evacuation operations (SPOPH T-15—15 September 1942, Headquarters, 808 Washington) which provided for coordination with and mutual assistance in civilian defense.

1. Operations continued but no further civilian defense aspects as of 30 June 1943.

2. By mutual agreement and directives from Army and Civilian Defense Offices, mutual support through Army staffs and T/O units and civilian defense affiliated units and mobile teams developed in spring 1943.

4. Civil health affairs established as a major function in Supreme Headquarters, Allied Expeditionary Force 8 May 1944 and continued through United States headquarters to date.

5. Civil health affairs established as a major function in Headquarters, Supreme Commander Allied Forces in Pacific, summer 1945.

6. Surgeon General of the Army directed development of study on integration of administration of civil with military health affairs, March 1944.

National Security Act of 1947 set up agencies for administration and integration of civil and military plans and operations, 28 July 1947 (Public Law 243, Eightieth Congress).

8. Medical Advisory Committee established within the National Security Resources Board by the chairman, announced 20 July 1949.

9. Committee on Medical and Hospital Services of the Armed Forces (Hawley) established by the Secretary of Defense in a letter dated 1 January 1949.

10. Armed Forces Medical Advisory Committee (Cooper) established by the Secretary of Defense, announced 12 December 1948.

11. Office of Civil Defense Planning established by the Secretary of Defense in a letter dated 27 March 1948.

another war was cited. Many factors governing the economic evaluation of plant locations were listed by the Board, but there was no mention of health and medical service factors. These were deemed of maximum importance by the United Kingdom, for the logic of which we may go on to other lessons.

2. *National patterns were developed during World War II by the United States, the United Kingdom, Japan and Germany* (in the order of their success in escaping direct damage by enemy actions) — These are summarized in table I.

TABLE I.—Industrial medical preparedness patterns developed during World War II

Activity considered	United Kingdom	United States	Japan	Germany
Proceeded on national disaster efforts	Yes	Yes	No	No
Conducted an economic and political unit	Yes	Yes	Yes	No
Homeland attacked by enemy	Yes	No	Yes	Yes
Mobilized armed forces at earliest practicable time	Yes	Yes	Yes	Yes
Increased pressed time mobilization preparedness	Yes	Yes	Yes	Partially
Developed and expanded effective civil defense at earliest practicable time	Yes	No	No	No
Continued capacity for increasing productive output at beginning	Yes	Yes	No	Yes
Shifted economic and industrial effort to preservation of war at earliest practicable time and to insurance drive	Yes	No	No	No
Mobilized own enormous armed strength appropriate by total economic and industrial potential	Yes	No	No	No
Increased productivity home-front participation by women, noncombatant men, and the physically handicapped	Yes	No	No	No
Applied maximum practicable war production capacity of women	Yes	No	No	No
Estimated situation with reasonable accuracy	Yes	Partially	No	No
Planned ahead on realistic long-range basis	Yes	No	No	No
Coordinated management of all able resources	Yes	No	No	Partially
Intensified military and civilian use of resources	Yes	No	No	No
Observed by scientific method the effects of prescribed policies on living conditions and use of manpower	Yes	No	No	Partially

The Prime Minister and the Minister of Defense, Strength and Conditions of the Armed Forces and Auxiliary Services of the United Kingdom 1939 to 1945, London, H. M. S. O. (Cmd. 6512) 1946.

United States Strategic Bombing Survey: The Effect of Bombing on Health and Medical Care in Germany. United States Government Printing Office, Washington, D. C. 1945.

United States Strategic Bombing Survey: Data from various reports of the group.

The Ministry of Labour and National Service: Committee on Fit and Men in the Services. Second Report and Memorandum by the War Office, London, H. M. S. O. (Cmd. 6380) 1942.

United States Strategic Bombing Survey: The Effects of Strategic Bombing on the German War Economy. United States Government Printing Office, Washington, D. C. 1945.

In the early 1930's German war production was not hampered by her war potential or resources but by demand, that is, by the actions of the German war leaders as to what was required for achieving their aims (Dr. Theodor Dittus plan for "long war" nor even they prepared for).

Churchill, W. The Second World War: The Gathering Storm. Houghton Mifflin Co. Boston, Mass., 1945.

United States Strategic Bombing Survey: Summary Report (Pacific War). United States Government Printing Office, Washington, D. C. 1946.

3. *A clear pattern of certain essentials must be preplanned and assured for a mobilization to avert the disasters of war*—In order of importance they are water and food, fighter aircraft or defensive guided missiles, coal, liquid fuels, and lubricants, transport by ground, sea, and air, communications, iron, and steel, other metals, certain chemicals, and medical material and services.

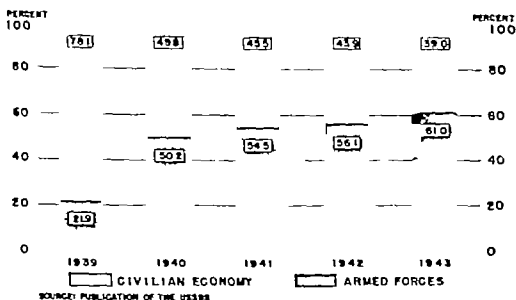


Figure 4.—German percentage distribution of industrial labor force producing for civilian economy and for armed forces as of May 31 1939-43

4 Success in modern war requires maximum national mobilization and performance from the first intimation of war—This involves coordination of unbelievable complexity and maximum integration of military and civilian plans and operations. Experiences of World War II indicate the necessity for a. National service from the start b. Maximum military mobilization of air sea, and ground forces from the start with such changes in strengths and missions allotted to each as may become necessary c. Maximum diversion of the civilian economy necessary to (1) hold off the enemy guided missiles and other attacks (2) attack and destroy or disperse enemy forces, (3) occupy govern, and reestablish over the former enemy an acceptable new or revised government (primarily ground force responsibility), and (4) protect this nation from any future repetition of war d. Maintenance of national mobilization only so long after hostilities cease as may be necessary to (1) control the former enemy (primarily ground force responsibility but involving sea and air forces to a maximum from time to time) (2) reconversion of our own economy to peacetime pursuits and (3) have power to bargain and establish acceptable international relations during the postwar era to prevent menacing international situations, and to assure arranging of desirable peace treaties involving former enemies allies neutrals, and others. e. Involvement of minimum practicable number of governmental agencies with necessary major efforts whether they be



military or civilian, and their coordination.<sup>12</sup> f. Maximum integration for planning administration, and implementation of necessary activities between the armed services and between military and civilian authorities.<sup>13</sup>

5 *Every nation is vulnerable to attack by a powerful enemy*<sup>14-15</sup>

6 *There are definite priorities for military missions of any nation*, the industrial support of which depends on a clear understanding of those priorities and of the programs for meeting them. The primary missions of any nation in order of priority are to (a) prevent military attack against the homeland (b) attack and subdue the enemy armed forces (c) attack and subdue the enemy homeland and (d) occupy the enemy homeland and govern the enemy civilian population as long as necessary

Not only government but also management, labor, the industrial physicians, public health physicians, and private physicians must understand this matter sufficiently to permit proper training, use, and physical and mental protection of personnel. There can be no bargaining on three points (a) A failure to guarantee success to our Armed Forces against enemy attacks will insure our ruin, regardless of the extent to which our civilian economy may be disrupted by war (b) Allocation of certain means to civilian uses is as necessary to successful combat as is allocation to military uses and (c) Proper balancing between civilian and military requirements is our objective.

7 *Repeated forceful enemy attacks against our civilian population will result ultimately in economic collapse, submission, then defeat regardless of our successes in combat.*

8 *Enemy attacks against the homelands of three nations during World War II followed a pattern characterized by homeland capacities for resistance to attack.*—The pattern of collapse is (a) loss of control of the air (b) lack of coal (c) lack of liquid fuels and lubricants (d) insufficient transport and communications (e) insufficient food (f) lack of steel (g) insufficient armaments and ammunition (h) insufficient civilian supplies (i) insufficient raw materials such as iron and light metals (j) insufficient services and utilities (k) lack of capital equipment (l) insufficient skilled manpower (m) in-

Armed Forces Review Report—Release 112, Industrial Mobilization, 1949

W. Department Military Hospitalization and Evacuation Operations United States Government Printing Office Washington, D. C. 1942

A Report by the President Air Policy Commission Staff 12th to 21st April 1945 United States Government Printing Office Washington, D. C. 1945

Doc. S. A. P. 10000 X. Total Defense 1945 to 1951 The Library of Congress, Washington, D. C. 1945

Blum, T. Modern Arms and Free Men. Simon and Schuster New York. N. Y. 1949

sufficient total manpower (n) insufficient construction capacity (o) insufficient medical and health supplies, and (p) insufficient medical and health services.

9 *New weapons will appear*<sup>18 19</sup>—At first these will be those which can be produced quickly. Others will appear from time to time by extension of research and development during the war.

10 *New protective measures or means for counterattacks will be developed*—As new offensive and defensive means develop, planning, strategy, tactics, and operations must change.

11 *The civil population and its industrial facilities must adapt to ever-changing circumstances just as readily as armed forces*—Swift changes or shifts of persons and organized units of manpower (of both sexes) must be possible, as well as material, services, and techniques.

12 *Complex modern weapons, modern manufacturing and modern society necessitate a large and ever increasing number of skilled and trained men and women*<sup>18 20</sup>

13. *Modern war creates an ever increasing demand for complex equipment and enormous quantities of supplies*—As an example, a recent study by the staff of the Army Surgeon General revealed that the barest minimum of medical equipment and supplies necessary to save and maintain the life of one atomic explosion victim for from 3 to 6 days would weigh 50 pounds, displace 4.2 cubic feet and cost at least \$25 at current prices.

14. *Developing and improving military techniques will compel expedited and expanded industrial developments*<sup>21 22</sup>

15 *A competing nation must anticipate maximum adaptation of its internal economy to a potential theater of operations,*<sup>23</sup> the former will limit the latter's extent by the potential of economic resources, preplanned management<sup>23-24</sup> technologic developments of industry,

<sup>18</sup> United States Strategic Bombing Survey. The Effects of Bombing on Health and Medical Services in Japan. United States Government Printing Office, Washington, D. C., 1947.

<sup>19</sup> WILSON, W. L. The Army Surgeon. Part in Current Biological Warfare Defense Plans, Nov. 8, 1949.

<sup>20</sup> WILSON, W. L. Research Needed in the Field of Sanitation (particular attention to civil war problems). Conference Notes, Sanitation Study Section, National Institutes of Health, United States Public Health Service, Jan. 25, 1949.

<sup>21</sup> WILSON, W. L. Military Responsibility in Civil Public Health. Lecture V Military Hygiene, United States Military Academy, Sept. 16, 1948.

<sup>22</sup> WILSON, W. L. Medical and sanit. by care of civilian population necessitated by attacks from hostile aircraft. Army M. B. II (no. 99) pp. 63-107, Jan. 1941.

<sup>23</sup> WILSON, W. L. Medical aspect of government services in time of national emergency. Bull. U. S. Army M. Dept. 4403-494, July 1948. J. A. M. A. 137 (Organization Sect.) 793-795, June 29, 1948.

<sup>24</sup> WILSON, W. L. Medical plans for civil defense and disaster relief. U. S. Armed Forces M. J. 1, 46: 473, Apr. 1950.

<sup>25</sup> WILSON, W. L. Civil organization of health in time of war. Bull. U. S. Army M. Dept. 44774-789, Oct. 1948.

this involves maximum integration of military and civil administration.<sup>20, 21</sup>

### DISCUSSION

To apply these lessons we should (1) make sure that we are ready at any moment should disaster strike (2) be prepared to apply to maximum advantage all the means we shall have available and do this efficiently economically and immediately and (3) ask ourselves whether our industries would be prepared if disaster should come. True disaster is ever-changing and outdoes itself during war. Therefore, any agreements we reach now might be obsolete at an early date unless we continue our attention to them. The seriousness of the situation we might have to face should be a great stimulus to proceed with the task at hand without delay. The lessons should be so applied that we will guarantee avoidance of the disasters we have considered, or at least that we shall not be overwhelmed. We should and can guarantee both if we act promptly. Suggested answers to our question will be restricted to activities proper for industrial health personnel to undertake actively. Let us test every proposal for action by the British concept that the organization of war is largely a question of priorities: the first for whatever may be necessary to keep the machines of war in action, the second for making optimum use of available skills.

Although the following suggestions should be accepted and implemented only after careful consideration, action should be the rule and further discussion and delay avoided.

#### 1. For an interim period, starting now

a. Uniform professional advice in industrial health affairs concerned with disaster control should be promulgated to management, labor leaders, health staffs, governmental agencies, and other interested organizations. This is particularly applicable to necessary means, their availability, development of optimal industrial environments, health aspects of migrations and evacuations, and of relocation of plants, facilities, services, equipment and personnel.

b. Every advantage must be taken of opportunities to learn the responsibilities and authorities of workers, agencies, and groups who will engage in the broad field of disaster control. In this connection full study should be made of the fact that the only States having specific legislation for civil defense in disaster operations prior to 1

<sup>20</sup> Wilson W. L. Administration of civilian medical care in total war. *Dev. U. S. Army Med. Dept.* 9: 197-210, Feb. 1949.

<sup>21</sup> Wilson W. L. Military-Civil Cooperation of Health Services for Disaster Control. University of California School of Public Health, Berkeley, Jan. 8, 1949.

January 1960 were California, Indiana, Maine, Maryland, Michigan, Montana, Nebraska, New Hampshire, New Jersey, Ohio, Oregon, South Dakota, Texas, Utah, and Washington

c. Every plant health service and every plant, industrial unit, industry, and corporation should have a simple, workable, written plan to meet any foreseeable disaster. It should fit the means known to be available and every participant should know and understand his part.

d. We should initiate immediately all studies and projects which require attention locally or nationally. This should be done by preparing and publishing a list of all matters related to industrial health which would be involved in local or broader disaster control. The list should be arranged according to urgency or priority for action and rearranged regularly as indicated by experience.

e. We should consider everything possible to learn about the proper values and priorities to be assessed to various factors related to disaster control.

TABLE 2.—*Relationships in medical planning for disaster control*

Government agencies		Civilian agencies	
Civilian Local State Military Army Area Headquarters Naval District Headquarters Air Force Area Headquarters	Coordination, integration, and complementation	Plant Industry Corporation	Management Labor Medical staff Management Labor Medical staff
National Security Resources Board		Plant Industry Corporation	Labor Medical staff

2. For long range application of the lessons learned we should (a) immediately insure a system to continue revise and maintain all plans (table 2) (b) continue to improve operational systems which have been designed in the interim, have been tested and have been maintained for meeting disasters in a usable, stand by status (c) continue to improve those studies and research projects we shall initiate in the interim, adding to or deleting from them as required, (d) at the earliest practicable time determine the minimal quantity and quality of health services which would be required for industrial workers subjected to disaster with particular attention to on-duty and off-duty requirements for the personnel themselves, as well as requirements for members of the community not employed by the industry but whose health must be maintained to insure maximum productivity of the employees (e) insure coordinated and judicious suggestions on all subjects or problems requiring investigation or research and which pertain to any field of industrial health concerned

with disaster control, and transmit them to the Research and Development Board, Department of Defense, if primarily military in nature or to the National Research Council if not primarily military in nature but important to national defense. (f) actively sponsor the earliest practicable establishment of an authoritative and scientific classification of the entire population into categories of physical and mental fitness for specified duties or activities because only by this means can rapid, successful assignments to duties be made and large numbers of people shifted in emergencies to perform essential work in a safe and healthful way. (g) sponsor in a similar manner authoritative and scientific determination and publication of true minimal nutrient requirements for the predetermined categories of the whole population, for short and long term periods of survival or existence under various physiologic conditions because only by such means will public food planning be undertaken scientifically or can people subjected to major disasters be assured of adequate food. (h) solve the problems related to fatigue, particularly its cause, prevention and treatment as well as scientific measurement before, during, and after occurrence. (i) develop all the knowledge and techniques necessary for maximum employment of women, the disabled or handicapped, the aged, persons of both sexes under 18 years old, employees shifted because of dispersal activities, persons involved in evacuations or migrations, and persons compelled to do productive work in any unpleasant, unhealthful, or hazardous environment along with means and methods for maintaining or improving their health while employed. (j) develop the most efficient and economical administration of health services to be employed in disaster control. (k) learn the psychologic effects of and method for handling inadequate nutrition, disaster, stresses of war, fatigue or industrial environmental stresses. (l) apply all the known preventive and therapeutic measures to development of physical and mental health in the leaders and supervisors of industry and continue to seek new ones. (m) develop and train the best possible professional health leadership for industrial health services, particularly increasing their experience in sociologic factors. (n) develop all proper health means and measures which will insure placement of the proper employees in the proper duties, including the managing or supervisory staff, the employees and the industrial health services' staffs, and (o) understand safety and accident prevention measures with particular attention to the cause, medical and administrative handling, psychologic aspects and prevention.

<sup>1</sup> The Food and Nutrition Board, National Research Council. Proceedings, Vol. IX, pp. 61-62. The National Research Council, Washington, D. C., 1949.

We could not improve on the theme furnished us many centuries ago by the famed Sun Tzu <sup>21</sup> when he said "If the campaign is protracted, the resources of the State will not be equal to the strain" and "when your weapons are dulled, your ardour damped, your strength exhausted and your treasure spent other chieftains will spring up to take advantage of your extremity. Then no man, however wise, will be able to avert the consequences that must ensue."

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<sup>21</sup> See footnote 2, table 1.





# Dentistry in the British Army

H. J. HIGGINS, *Major General Royal Army Dental Corps*

B. H. WOODS, *Colonel Royal Army Dental Corps*

UP TO the outbreak of the South African War in 1899 dental treatment in the British Army may be said to have been non-existent. Although a dental pouch consisting of eight instruments, designed for the extraction and scaling of teeth, was authorized for the use of Army surgeons, the only interest taken in the oral condition of the soldier was to ensure that he possessed sufficient incisor teeth to enable him to bite the cap of the charger before passing the powder into the muzzle of his musket. In 1901 four civilian dental surgeons were dispatched to South Africa to treat troops in the field. In 1910 the employment of eight civilian dental surgeons in the United Kingdom and three in India was approved.

At the outbreak of World War I the provision of dental treatment for the Army was still almost negligible and no dental surgeon accompanied the British Expeditionary Force to France in August 1914. Shortly after however dental surgeons were for the first time appointed to temporary commissions and attached to the Royal Army Medical Corps for duty at home and overseas. At the time of the Armistice in 1918 a total of 850 dental officers were serving.

On 4 January 1921 the Army Dental Corps was formed as an integral part of the Army Medical Services and an Inspector Army Dental Service was appointed to the staff of the Director General, Army Medical Services at the War Office. This Corps was a joint service for the Army and the Royal Air Force until the formation in 1930, of the Royal Air Force Dental Branch.

In 1940 His Majesty the King graciously approved that the Army Dental Corps should be designated "The Royal Army Dental Corps" (RADC) and a new badge to replace the former one was also author-



ized. This new badge consists of "Within a laurel wreath, a dragon's head and sword beneath a scroll bearing the motto 'Ex dentibus ens.' The whole surmounted by a crown. The dragon's head and blade of the sword is in silver plate, the remainder of the badge—gold."

*Origin of the design.*—The dragon is an emblem of dentistry in China, and is also associated with armies and teeth in the legends of Cadmus and Jason in Greek mythology. Both these characters are reputed to have slain dragons, won their teeth, and reaped armies. The sword is intended to denote the branch of the Armed Forces to which the Corps belongs.

*Administration of the RADC.*—In addition to a Director and Assistant Director of Dental Service on the staff of the Medical Directorate at the War Office, Deputy Directors of Dental Service are borne on the establishment of the Medical Branch at Headquarters of Commands in the United Kingdom and overseas.

*Specialist dental officers.*—Dental officers who, by virtue of their experience, qualifications, et cetera, are classified as specialists are attached to the larger military hospitals, and, on active service, to maxillofacial teams.

*Dental officers.*—In addition to those serving with military hospitals, officers are assigned to dental centers, dental laboratories, mobile dental units, and under active service conditions to Casualty Clearing Stations and Field Ambulances. Dental centers vary in size from 1 to 20 officers, equipped with chairs according to requirements and are located in military camps, training establishments, and depots.

*Commissions.*—There are, at present, three types of commissions for dental officers: (1) regular (permanent), (2) short service (for 4 years), and (3) National Service (for 18 months). Promotion to captain occurs after 1 year's service, to major after 8 years' service, to lieutenant colonel and above is by selection to complete establishment.

*Training.*—All newly commissioned officers on first appointment and enlisted personnel (dental technicians and dental operating room assistants) are assigned to the Depot and Training Establishment, RADC, for initial military training and instruction. In addition refresher and promotion courses are held as required. Selected officers are from time to time, attached to civil plastic and head injuries hospitals.

The following chronologic data indicate the main developments from 1600 to 1950

TABLE 1—*The dental standards for recruits*

1600-1600	Men required sufficient incisors to open the hand-lever (powder charge)
1678-1810	Grenadiers needed sufficient incisors to open the fuse of the grenade.
1600-1863	Whole of Infantry required sufficient incisors and canines to tear open the cartridge (combining powder charge and bullet)
1708	First instructions for medical inspection of recruits.
1821-1863	Loss of many teeth particularly of the incisors and canines, was a cause for rejection.
1863	The modern pin-firing mechanism was introduced superseding the earlier cartridge and incisors and canines lost their earlier significance.
1863-1868	Loss of many teeth was cause for rejection.
1869	Recruits must possess a sufficient number of sound teeth for efficient mastication."
1900-1914	"Loss or decay of teeth to such an extent as to interfere materially with efficient mastication was cause for rejection.
1921-1930	"The eleven-point standard, a simple practical guide— Sound or repairable functional—incisors, canines and premolars counted as one point each. First and second molars as two points each. Third molars (according to development) as one or two points each. Maximum possible points, 22 Minimum points required, 11 that is 50 percent masticating efficiency
1937	The standard was modified for other than front-line troops.
1939-1950	All standards in abeyance except for candidates for commissions.

TABLE 2—*Authorized dental equipment*

1600-1708	Army surgeon supplied his own.
1708-1820	1 key instrument
1820-1838	1 key instrument. 1 tooth forceps. 1 tooth lever
1838-1857	1 key instrument. 1 tooth forceps. 1 punch. 1 gum lancet.
1857-1900	1. forceps 6 elevators (to fit one handle) 1 key instrument. 1 gum lancet.
1900	8 forceps. 6 elevators. 1 mouth mirror 1 gum lancet.
1904-1914	Restricted—modern.
1914-1950	Full scale—modern.

Forerunner of leverator

TABLE 3—*Dental treatment 1600-1950*

1600-1600	Extractions only by Army surgeons.
South African War (1899-1902)	
1601-1602	General treatment (except dentures and repairs) by 4 contract dentists in the field.
1603-1608	Conservative treatment by 8 full-time contract dentists.
1600-1914	Limited conservative treatment by part time civilian contract dentists.
World War I (1914-1918)	
1914-1921	All necessary treatment by temporary Army dental officers.
1921-1945	All necessary treatment by "The Army Dental Corps"—the first regular dental officers.
1947	Designation Royal Army Dental Corps and continuing full-scale treatment to date.

TABLE 4—*Army dental officers, 1914-18*

1914	August-October	None with Expeditionary Force in France.
	November	12
	December	20
		} For France only
1915	February	36 (Including the first for Home.)
	August...	150
1916	August...	300 (Compulsory Service Act.)
	December	460
1917	December	500
1918	May	First appointment of a dental officer to War Office to advise the Director-General, Army Medical Services, on dental matters
	August	700
	November	850

TABLE 5—*The Army Dental Corps, 1921-46*

		Officers	Other ranks
1921	Joint service for Army and Royal Air Force	107	123
1925	(R. A. F. section separated to form R. A. F. dental service)	124	
1931		136	
1935		153	279
1939 (Actual)		217	338
1946 (est.)		2,200	2,200

TABLE 6.—*Royal Army Dental Corps 1950*

## Officers (Regular)

Director Army Dental Service (major-general) at War Office.....	1
Assistant Director Army Dental Service (colonel) .....	1
Consulting Dental Surgeon to the Army (colonel) .....	1
Deputy Directors, Dental Service (colonels) .....	0
Commandant, Depot and Training Establishment, Aldershot (colonel) ..	1
Lieutenant-colonels .....	35

Majors, captains, and lieutenants as required to provide a ratio of 1

R. A. D. C. officer to 1,150 commissioned and enlisted personnel.

## Other ranks, R. A. D. C.

Approximately 1 dental operating room assistant to each R. A. D. C. officer

Approximately 1 dental technician to 3 R. A. D. C. officers.





# The Use of Base Shops for Manufacture and Repair of Medical Appliances

BRUCE R. HEINZEN *Captain U S A I R (MC)*

THIS article is written to point out the possibility of effective cooperation between the medical department and the base shops of Air Force installations. Undoubtedly, installations in all service branches have used local facilities to aid in the care and treatment of medical and surgical patients. This is ordinarily sporadic. A close liaison however allows for an enhanced use of local facilities as well as a significant saving of money. Such appliances as Taylor type back braces (fig 1) neck braces (figs. 2 and 3) and other items of this type can be constructed rapidly and at minimum cost by using salvaged pieces of equipment. Loss of time involved in transporting patients can thereby be avoided. This has been of increasing value since we have been using the Air Force convalescent rehabilitation program. Under this system, many man hours of useful employment are obtained while a patient is in the late stages of recovery and little or no time is lost from arranged hours of duty while a patient is undergoing fittings for an appliance.

Among the concomitant benefits from this liaison with personnel of the base shops is the noticeable feeling of teamwork which develops among the involved persons. In addition, the personalized attitude of the men making appliances invariably results in the achievement of small refinements in an appliance which increase the patient's comfort. In an organization such as a bomb wing several activities in nonmedical organizations readily become applicable to the needs of the medical group. For example the electronics shop will often be able to make minor repairs on cardiographs and physiotherapy equipment reducing the number of calls for a medical maintenance man.

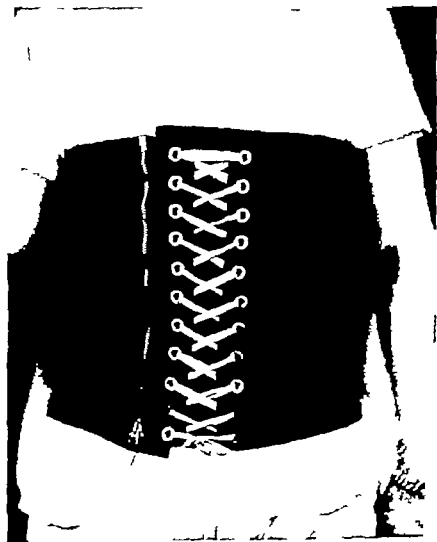


Figure 1.—Front view of hand-constructed back brace used by patient with and disk injury



Figure 2.—Neck brace constructed at base shop used in treatment of dislocated cervical vertebra.



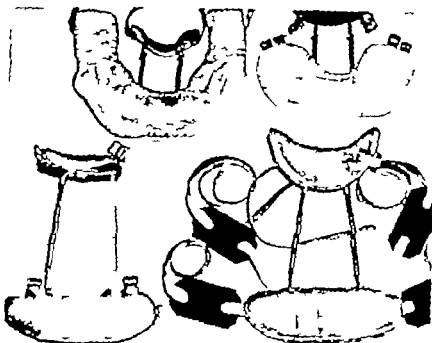


Fig. 3—Standard type commercial neck brace shown above and neck brace constructed at base hospital below.

The sheet metal shops can rapidly repair such items as a broken cast cutter or can speedily construct effective walking irons if demands exceed supply levels unpredictably. Parachute shops can produce leather padding for metal appliances. The only payment ordinarily needed is recognition of a man's efforts and honest attempts to aid him with his medical problems.



# About the Army Medical Service

## Procurement of Professional Officers

PAUL I. ROBINSON *Brigadier General MC U S A*

**A** REVIEW of the history of medical professional officer procurement for the past half century reveals an encouraging and continuing interest in professional training. The Army takes pride in its achievements over the years in the fields of preventive and curative medicine. These achievements need not be enumerated here because they are common knowledge to all medical officers. The advances in training fields have not so generally been made known. The fact is, however that on each occasion when the Army has used training programs as a means of procurement, the response has been phenomenal. In 1920, the Regular Army Medical Corps was brought to strength by the introduction of Army internships. In this same period the Army Nurse Corps was greatly augmented by specialized training of young women in various fields of nursing. The Army has also been a leader in fostering dental postgraduate training in the form of internships and residencies.

After World War II the deficits in various professional corps warranted expansion of training programs to an extent never before considered. All are acquainted with the military internship and residency programs and the civilian internship and residency programs for the Medical Corps, the Senior Dental Student and Dental Internship and Residency Programs for the Dental Corps, and the specialty training courses for nurses. Since V-J day these programs have been instrumental in obtaining 1,200 officers for the Regular Army Medical Corps, 384 officers for the Regular Army Dental Corps, and about 500 officers for the Regular Army Nurse Corps.

Professional training in the Army Medical Service is now an established fact. There is no reason why professional officers in the Army should not be able to reach the pinnacle of their ambitions in professional achievements. They can participate on an equal basis with

Number	Title	Running Time (min)
PMF 5090...	Neurolysis of the Ulnar Nerve in Lower Arm	8
PMF 5103.	Arterial Disorders in the Upper Extremity and Their Treatment by Sympathectomy	31
PMF 5105. --	Logistics I Review	13
PMF 5110.	Radioactivity	17
PMF 5111.	Demonstration of Cushing Experiment on the Dog	14
PMF 5114	Rickettsiae—Laboratory Procedure for Their Isolation and Identification	47
PMF 5116A	Time Out: Occupational Therapy in Tuberculosis	27
PMF 5116B	Occupational Therapy in Problems of Motion	24
PMF 5116C	Journey To Reality (Occupational Therapy for Acute Psychotics)	40
PMF 5117	Tibial Nerve Anesthetics in the Lower Calf	7
PMF 5118.	Diagnosis of Peripheral Nerve Injuries	18
PMF 5132	Method of Repair of Posterior Tibial Nerve	10
PMF 5133.	Ulnar Nerve and Soft Tissue Defect and Skin Grafts Repair in the Forearm.	10
PMF 5136...	Benign Dental Tumors	29
PMF 5137...	Malignant Oral Tumors	40
PMF 5140	Hereditary Ataxia	23
PMF 5143	Atomic Medical Cases—Japan, World War II	37
PMF 5148...	The Medical Effects of the Atomic Bomb—Pt. II Pathology and the Clinical Problem.	37
PMF 5149	The Medical Effect of the Atomic Bomb—Pt. III. Medical Service in Atomic Disaster	25
PMF 5151	General Adaptation Syndrome	84
PMF 5152F	Psychiatric Interview Technique Part VI	
PMF 5152H	Psychiatric Interview Technique Part VIII	
PMF 5162	Operation of the Valves of an Ox Heart	4
PMF 5163	Typhoid Vaccine Research	29
PMF 5166	Electrocardiography	10
PMF 5169	Experimental Thiamin Deficiency	7
PMF 5170	Heart Lung Preparation	17

## Miscellaneous Films

MF 1296	Crossroads Radiological Safety Motion Picture	25
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## Training Films

TF 8-1520	Isolation Technique	18
TF 8-1536	The Medical Examination, Part I, Importance	19
TF 8-1537	The Medical Examination—Pt. II History	17
TF 8-1538	The Medical Examination—Pt. III Examination	17
TF 8-1560	Veterinary Preventive Medicine	17
TF 8-1568	Hospital Food Service Personnel Training Introduction—Part I	17
TF 8-1576	Hospital Food Service Personnel Training—Part II Personal Appearance Hygiene and Sanitary Food Handling.	33
TF 8-1577	Hospital Food Service Personnel Training—Part III. Equipment.	13

Number	Title	Running Time (min.)
TF 8-1586	Fractures—An Introduction	27
TF 8-1639 <sup>2</sup>	Medical Supply—Armed Forces	62
TF 8-1670 <sup>2</sup> ---	Habits and Characteristics of the Rat—Pt. I The Norway Rat.	29
TF 8-1671 <sup>2</sup> ---	Habits and Characteristics of the Rat—Pt. II The Roof Rat.	18
TF 8-1671 <sup>2</sup> ---	First Aid—Part I Major Wounds Fractures and Burns.	38

## Film Bulletins

FB 223 <sup>2</sup> ---	Veterinary Service With Army Animals—Part II. Evacuation and Treatment of Animal Casualties.	24
FB 225 <sup>2</sup> --	Veterinary Service With Army Animals—Part III Injuries and Diseases of Army Animals World War II	30
FB 228	Veterinary Food Inspection Service—Part II. Theater of Operations.	16

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All films have sound track.

Black and white

Limited distribution. Request must be sent direct to Director, Armed Forces Institute of Pathology—  
Attention: Medical Illustration Service





## Public Health Aspects of Biologic Warfare

Biologic warfare is the use of disease agents, or their toxic products, to produce disease or death in man, animals, or crops. This is public health in reverse. This method of warfare is not to be casually dismissed, nor should it strike terror in our minds. Many exaggerated and sensational statements, such as the widely quoted statement that 1 ounce of botulinus toxin can kill 200,000,000 people, have appeared in the press. Such quantities of materials could not be disseminated widely enough by an enemy to produce illness or death among more than a small fraction of such fantastic numbers of persons. The potentialities of biologic warfare are great, but in its present stage of development it should not be considered a means of mass destruction comparable to atomic warfare. Organisms that have been notorious producers of accidental infections among laboratory workers are the *types of agent most likely to be used*. The attempt could be made to introduce diseases which are already of usual or endemic occurrence in the area under attack because such an outbreak might not be recognized as warfare at all. The mere occurrence of an unusual disease on the other hand should not be labeled biologic warfare unless there is other evidence to substantiate such a claim.

It is possible to select agents which in effective doses could result in (1) a high fatality rate, (2) prolonged incapacitation with low fatality, or (3) only temporary illnesses. Although there are potential agents which spread rapidly from person to person, it is not at all certain that such a spreading epidemic could be set up at will. Even if an agent capable of direct transmission from person to person were used, public health and sanitary measures could limit the outbreak and minimize its effects, especially if coupled with adequate prophylactic and therapeutic agents.

If biologic warfare were initiated, it might be launched by the use of missiles and munitions, capable of transport by aircraft and designed to set up airborne clouds of biologic agents. Such use would be similar to chemical warfare, except that the effect would be delayed because of the incubation periods of the agents. Such munitions might be used in conjunction with blast weapons in order to take advantage

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VENTS ET PHILIP K. FRANKEL (Commander MC, U. S. N.) Consideration of certain public health aspects of defense against biological warfare. Read at the American Public Health Association Meeting, St. Louis, Mo., 21 October 1940.

of disrupted sanitation and medical service. The aerosols of biologic warfare agents produced under such conditions would rapidly disperse into infective clouds which would be odorless, tasteless, and invisible and, thus, extremely difficult to detect. An important defense is military interception and prevention of the attack. Another method of dispersal involves the clandestine introduction of these agents into the air, food, or water supplies by saboteurs. Internal security measures directed against the saboteur or against his access to food, water supplies, or important areas are the important defensive measures.

The greatest return for the least expended effort would be the use of biologic warfare in thickly populated areas. The greatest defensive effort must be directed toward these likely target areas and others such as key industrial, communication, and governmental centers. Every competent epidemiologist, physician, bacteriologist, veterinarian, nurse, or sanitarian who is well informed regarding the communicable diseases has already acquired the information necessary to the formulation of many civil defense principles. A few such principles are: (1) Civil defense against biologic warfare must be coordinated with defense against other forms of warfare. (2) Biologic warfare agents produce the usual disease characteristics of the given agent, although the clinical course may be expected to vary. (3) Management and control of communicable diseases, including isolation and quarantine, remain the same whether the diseases occur in the natural course of events or are introduced by an enemy. (4) Preparedness for rapid diagnosis and therapy is important not only for those diseases of usual or endemic occurrence but also for those considered exotic or of unlikely occurrence except by artificial dissemination. (5) Plans for availability of chemotherapeutic and antibiotic substances should be made. (6) Immunization might be presumed to afford a measure of specific protection against potential agents. (7) Vaccines afford considerable protection and would be of value if an adequate warning of probable biologic or chemical attack could be given. (8) Food and drinking water, if suspected of contamination by biologic warfare agents, may be sufficiently sterilized by boiling. (9) Public health authorities must be prepared to cope with the panic which any unusual incidence of disease is apt to cause. (10) The speed of modern transportation, considered together with the incubation period of disease caused by potential agents capable of person-to-person spread, is important as a factor in biologic warfare. (11) Specialized training involving access to the more highly classified biologic warfare information for a few well-qualified epidemiologists and public health personnel in key State, territorial, or local positions is desirable. (12) The task of planning civil defense has been charged to the National Security Resources Board.

## Navy's Color Atlas of Pathology

The *Color Atlas of Pathology* prepared by the Navy and the first such comprehensive work of its kind in the world was published in November 1950 by the J B Lippincott Co. of Philadelphia Pa. In process of preparation over a period of 6 years, the Atlas is looked upon as an important contribution to medicine and its allied sciences. It will serve as a useful tool in the study and interpretation of both gross and microscopic findings in pathology.

The Medical Department of the Navy has long recognized the need for a means of providing a more adequate background in pathology to a wider range of students of the medical sciences. It is difficult for teaching institutions always to secure a sufficiently large representation of specimens for study and practicing physicians have often lamented the lack of access to files of material for diagnostic work of their own. Only in recent years, with the advent of new processes for accurate color photography and printing has it been within the realm of possibility to assemble and publish a guide designed to meet these deficiencies.

The ground work for this *Color Atlas of Pathology* was laid by the U S Naval Medical School of the National Naval Medical Center at Bethesda Md in 1944 and numerous obstacles had to be overcome in the succeeding years finally to bring this endeavor to fruition.

A number of the requisites essential to such an undertaking were concomitants of World War II. Chief among these should be mentioned the availability of artists of particular talent and training. Also important was the opportunity to use material belonging in the Pathology Department of the Navy's Medical School the Army (now Armed Forces) Institute of Pathology Johns Hopkins Hospital and Georgetown University. These rich sources of material facilitated the correlation of clinical histories and findings with related pathology adding immeasurably to the value of the presentations.

The Navy was most fortunate to find in the person of Commander Charles F Geschickter Medical Corps U S Naval Reserve, wartime head of the Department of Pathology at the Naval Medical School one who was eminently qualified to evaluate correlate and to assimilate this material. Doctor Geschickter worked with Commander



W. W. Ayres, Medical Corps, U. S. Navy and currently Chief Pathologist, U. S. Naval Medical School, under the direction of Rear Admiral Lamont Pugh, Medical Corps, U. S. Navy, currently Deputy Surgeon General of the U. S. Navy but who was commanding officer of the U. S. Naval Medical School when the Atlas project was in its incipency and who has continuously been a leading figure in its progress and ultimate consummation.

The *Color Atlas of Pathology* is the first of three such volumes and covers hematology, spleen and thymus, lymph nodes and tonsils, the respiratory system, the liver, oral cavity, gastrointestinal tract, heart and blood vessels, kidney and urinary tract and the skeletal system. The second volume dealing with pathologic conditions peculiar to the specialties (neuropathology, dermatology, endocrinology, et cetera) and a third volume devoted entirely to oral and dental pathology are in process of preparation. These two additional volumes are being compiled and edited under the auspices of the U. S. Naval Medical and U. S. Naval Dental Schools respectively at the National Naval Medical Center, Bethesda, Md. The volume devoted to pathology of the specialties will probably be ready for publication in 1953 or 1954. The volume on oral pathology will probably be published much earlier.



## BOOKS RECEIVED

- Oral Pathology A Histological, Roentgenological, and Clinical Study of the Diseases of the Teeth, Jaws, and Mouths**, by Kurt H. Thomas, D. M. D. F. D. S. R. C. S. (Eng.) F. D. S. R. C. S., h. c. (Edin.) *Professor of Oral Surgery Emeritus and Brackett Professor of Oral Pathology Harvard University* *Harvard Professor of Pathological Faculty Boston University* *Lecturer in Oral Surgery Graduate School of Medicine University of Pennsylvania* *Member of Board of Consultants formerly Oral Surgeon and Chief of Dental Service Massachusetts General Hospital* *Oral Surgeon at Brook Hospital, Chicago* *Surgeon, New England Baptist Hospital* *Beth Israel Hospital* *Tumor Department of Boston Dispensary New England Center Hospital* *Fletcher Hospital* *Consultant in Surgery Army Medical Center and Command in Oral Pathology Armed Forces Institute of Pathology Washington D. C.* 3d edition, 1930, pages with 1600 illustrations including 781 color. The C. V. Mosby Company, St. Louis, Mo., publisher 1930. Price \$1.36.
- Thrombotic Conditions and Their Treatment With Anticoagulants**, by Charles D. Marple, M. D., *Assistant Clinical Professor Division of Medicine University of California Medical School at Francisco California formerly Research Fellow Department of Medicine Cornell University Medical College and Assistant Physician in Chief of Patient Treatment New York Hospital, New York City* and Irving S. Wright, M. D., *Professor of Clinical Medicine Cornell University Medical College and Attending Physician in Chief New York Hospital, New York City* 418 pages illustrated. Charles C. Thomas, Publisher Springfield, Ill., 1930. Price \$2.50.
- Urgent Diagnosis Without Laboratory Aid Discussion of the External Signs of Conditions Which Threaten Life**, by Prof. Dr. Hanns L. Haas, *Professor of Internal Medicine University of Munich formerly Medical Director and Physician in Chief of Hospital of Munich-Schwabing* Publication Number 60, America Lectures Series. 80 pages. Charles C. Thomas, Publisher Springfield, Ill., 1930. Price \$2.
- Neurosis and Psychosis**, by Denish Chamberlain Bowdman, M. D., *Assistant Professor of Psychiatry University of Illinois College of Medicine Chicago Ill.* foreword by Francis J. Getty, M. D., *Professor of Psychiatry and Head of the Department of Psychiatry University of Illinois College of Medicine Chicago Ill.* 172 pages. Charles C. Thomas, Publisher Springfield, Ill., 1930. Price \$1.50.
- A Manual of Physics**, by J. A. Crowther, Sc. D. F. R. S. 1. *Assistant Fellow of St. John's College Cambridge Professor Emeritus of Physics in the University of Reading* 5th edition. 594 pages, illustrated. Oxford University Press, New York, N. Y. publisher 1930. Price \$4.25.
- Researches in Binocular Vision**, by Kenneth N. Ogil, Ph. D. *Recit. Biophysics and Biophysical Research Research Council in the British Ophthalmology Mayo Foundation and Mayo Clinic Rochester, Minn.* 345 pages illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher 1930. Price \$7.50.
- An Integrated Practice of Medicine Volume 1** pages 4173-4907 by Harold Thomas Hyman 734 pages. W. B. Saunders Co., Philadelphia, Pa., publisher 1930. Price \$10.
- Bronchoesophagology** by Chevalier Jackson, M. D., F. D. L. D. F. A. C. S., *Harvard Professor of Bronchoesophagology and Larynx and Esophagus Temple University Philadelphia* and Chester L. Jackson, M. D., F. D. S. F. A. C. S., *Professor of Bronchoesophagology and Esophageal Surgery Temple University Philadelphia* 366 pages illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher 1930. Price \$1.50.

- The 1936 Year Book of Radiology** (J an 1935-June 1936). Radiologic Diagrams edited by Fred Jensen Hedges M. D. Professor and Chairman Department of Radiology University of Michigan and John Floyd Holt, M. I. America Professor Department of Radiology University of Michigan. Radiology Therapy edited by Leodore Lampe M. D. Associate Professor Department of Radiology University of Michigan and Robert B. Martiny M. D., Assistant Professor Department of Radiology University of Michigan. 440 pages Illustrated. The Year Book Publishers, Inc., Chicago, Ill., publisher 1936. Price \$4.75.
- Pediatric X-ray Diagnosis, A Textbook for Students and Practitioners of Pediatrics** Bergery and Radobsky by John Caffey A. B. M. D. Professor of Clinical Pediatrics, College of Physicians and Surgeons, Columbia University Attending Pediatrician and Radiologist Babes Hospital, and T. Adair Clark M. D. New York City Consulting Pediatrician Grange Hospital Westchester County and New Rochelle Hospital, New Rochelle N. Y. Consulting Radiologist Grange Memorial Hospital Orange N. Y. Consultant in Pediatric Radiology The New York Hospital, New York City 2d edition 86 pages Illustrated. The Year Book Publishers, Inc. Chicago, Ill., publisher 1936. Price \$22.50.
- The Community and Public Health Nursing, A Handbook for and About Boards and Citizens Committees**, by Edith Wheeler For The National Organization For Public Health Nursing. 376 pages. The Macmillan Co., New York, N. Y. publisher 1936. Price \$2.50.
- Principles of General Psychopathology An Interpretation of the Theoretical Foundations of Psychopathological Concepts**, by Siegfried Fletcher M. D. Clinical Instructor in Psychiatry University of Illinois formerly Professor of Psychiatry and Neurology University of Breslau 327 pages Illustrated Philosophical Library New York, N. Y. publisher 1936. Price \$4.75.
- Measles's Tropical Diseases, A Manual of the Diseases of Warm Climates**, edited by Sir Philip H. M. MacCall, C. M. G., D. R. O. M. A. M. D. D. T. M., and H. C. Mah. F. R. C. P. Lond. Past President of the Royal Society of Tropical Medicine and Hygiene London and the Medical Society of London. Consulting Physician to the Hospital for Tropical Diseases London. the Albert Dock Hospital and Tilbury Hospital. Consultant in Tropical Diseases to the Admiralty. Formerly Consulting Physician to the Colonial Office and Crown Agents for the Colonies. Formerly Consultant in Tropical Diseases to the Royal Air Force and Ministry of Pensions. Late Director Division of Tropical Medicine London School of Hygiene and Tropical Medicine and Lecturer on Tropical Medicine. the London Hospital Corresponding Member of the Societe de Pathologie Exotique and of the Societe de Med. Trop. Member of the Washington Academy of Medicine Examiner in Tropical Medicine to the Colonial Board of the Royal College of Physicians and Royal College of Surgeons England, Lat. Examiner to Cambridge and Hongkong Universities. Author with A. Alcock of "The Life and Work of Sir Patrick Manson." "The Dysenteric Disorders" 1919 and "Synopsis of Tropical Medicine" 1918. 12th edition 1,138 pages, with 11 colour plates 8 half tone plates 1 figure in the text, 8 maps and 29 charts. The Williams & Wilkins Co., Baltimore, Md., publisher 1936. Price 7s.
- Differential Diagnosis of Internal Diseases, Clinical Analysis and Synthesis of Symptoms and Signs**, by Julius Bauer M. D. F. A. C. P. (Clinical) Professor of Medicine College of Medical Evangelists, Los Angeles Bauer a leading Physician Los Angeles Co. at General Hospital. Consultant in Medicine White Memorial Hospital, Long Beach T. and Administrative Hospital, and Cedars of Lebanon Hospital. Los Angeles. Former Professor of Medicine University of Kansas 464 pages Illustrated. Grune & Stratton, New York, N. Y., publishers, 1936. Price \$12.
- Evaluation in Physical Education, Better Teaching Through Testing**, by M. Gladys Scott Professor of Physical Education at University of Iowa and Katharine French Professor and Head Department of Health and Physical Education for Women Illinois State Normal University 249 pages Illustrated. The C. V. Mosby Co. St. Louis, Mo. publisher 1936. Price \$4.

## BOOK REVIEWS

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**Nursing in Prevention and Control of Tuberculosis**, by H. W. Hetherington, M. D. M. R. C. P. (London) *Chief of Clinic of the Henry Phipps Institute of the University of Pennsylvania Assistant Professor of Medicine of the University of Pennsylvania School of Medicine Former Visiting Physician to the Walter Reed Sanatorium and Fannie W. Estleman, R. N. B. S., Supervisor of Public Health Nursing of the Henry Phipps Institute of the University of Pennsylvania Lecturer on Tuberculosis Nursing Department of Nursing Education of the University of Pennsylvania* Revised 3d edition. 301 pages illustrated. G. P. Putnam's Sons, New York, N. Y. publishers, 1930. Price \$4.50.

This book is a summarization of the nursing of the tuberculous patient, including the health supervision of the patient's family, case finding, prevention and control of tuberculosis in communities and among personnel caring for tuberculous patients. There are many requirements for good care and understanding of the tuberculous patient. The nurse must be well-informed on the subject and have good insight into the physical, emotional, and mental needs of each patient. This text includes new material in many of these fields. The public health aspect, rehabilitation, and patient training are stressed. In addition, basic principles of medical and surgical nursing, aseptic technic, and a general history of the disease are discussed.

The chapter on diagnosis explains the importance of the x-ray and laboratory procedures that are most frequently used. Tuberculin testing and BCG vaccination are discussed. The chapter on prevention describes the accepted physical facilities and method of sterilization used in the care of tuberculous patients, both in the hospital and in the home. Many of the recommendations for the physical facilities in hospitals would be an excellent guide for hospital administrators and nurses in promoting the safety and welfare of their patients and staff. Although this book would give the student a clear concise idea of the nursing care, aseptic technic and socioeconomic problems of the patient in the modern tuberculosis hospital, supplementary textbooks and references would also be necessary. To this end each chapter is followed by a list of such references.

—L. A. DE VOS

**Primer of Allergy** a guidebook for those who must find their way through mazes of this strange and tantalizing state by Warren T. Vaughan, M. D. M. D. P. M. d. 3. 173 pages illustrated. 3d edition revised by J. Harvey Black, M. D. Dallas, Tex. The C. V. Mosby Co. St. Louis, Mo. publishers 1930. Price \$3.50.

This primer originally written by one of our outstanding allergists, the late Dr. Vaughan has been ably revised by Dr. Black. It does not go as deeply into the subject as a text would but gives the essential features of allergy and its problems especially for physician in other fields. It is also a ready reference for any patient who would like to read up on the subject. It is well illustrated and contains an interesting series of questions and answers at the end.

—L. COLA J. BERRY M. C. L. B. I.

**Saints, Sinners and Psychiatry** by Camilla M. Anderson, M. D. *Assistant Clinical Professor of Psychiatry University of Florida* 206 pages, J. B. Lippincott Co., Philadelphia, Pa., published 1950. Price \$2.95.

This monograph presents the theory of normal and abnormal behavior in terms of disturbances in the structure or function of the personality. The author describes her theory as "a new formulation of the dynamics of behavior which has some detail in common with other theories (Freud, Adler, Sullivan, Schilder) but yet is distinctly different from all of them. Although one is inclined to question the need for any more psychiatric books intended for the layman because the market seems to be cluttered with them, the author's lucid and nontechnical presentation makes for easy reading if the reader is seeking explanation of why we behave as we do. On the other hand, the nondiscriminating layman may be duped into believing that the author is a accomplished and learned in ethics, theology and philosophy as he is in psychiatry. Actually the ethical philosophy advanced is a combination of secularism and pragmatism, and implies that our behavior would be more "realistic" were we to discard moral values. The title is misleading in that we learn nothing of how saints or sinners operate since the author confines her remarks to people who merely think they are saints or sinners. The viewpoint expressed is a combination of psychoanalytic concepts plus essentially non-Freudian psychoanalytic orientation. The realistic appraisal and acceptance of parents' shortcomings strikes wholesome not a time when parents are being made the scapegoat for all children's troubles. Residents in psychiatry may well derive more from this book than from many a longer text on psychiatry or psychopathology. It has little to offer the experienced psychiatrist other than to acquaint him with current theories of behavior the presentation of which were better made in scientific journals, rather than in a popular book with unfortunate diversion into the realms of ethics and metaphysics.—*Commentary by J. F. M. M. D. M. D. U. S.*

**Malignant Disease and Its Treatment** by Radham, by Sir Stanford Cade, K. B. E., F. R. C. S., M. R. C. P. *Surgeon, Westminster Hospital; Consultant to the Royal Free Hospital; and Lecturer in Surgery at the Royal Free Hospital; and formerly Examiner in Surgery at the University of London; Member of the Council and of the Court of Examiners of the Royal College of Surgeons in England; Honorary Member, American Radiological Society; Consultant in Surgery to the Royal Air Force* with a foreword by Sir Ernest Rusk, C. B., F. R. C. S., F. F. R., *Consultant Surgeon, and Vice President of Westminster Hospital*. Volume III, 2d edition. 416 pages. Illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price \$12.50.

The author in his preface to the first edition stated that Volume III described the natural history and treatment of malignant diseases. In the preface to the present edition, he states that Volume III deals with the common neoplasms of the breast and thorax, the abdomen and pelvis, and the male and female external genitalia. In perusing the volume one will search in vain to find large groups of malignant diseases within the abdomen even mentioned. The most conspicuous omissions are the malignant neoplasms of the small intestine, cecum, colon, and kidney. This volume consists of 7 chapters and covers malignant diseases of the breast, esophagus, stomach, uterus, vagina, female urethra, vulva, ovary, bladder, penis, rectum, anus, and intrathoracic tumors. The author himself has written the chapter on the breast and chapter on the bladder and penis. The other chapters have been written by or in collaboration with other British authorities.

The clinical types, natural history, symptoms and signs of the various neoplasms are well described. The subject of diagnosis is well illustrated by excellent pathologic concepts. Prognosis is well discussed and soundly evaluated on the basis of wide knowledge and extensive experience. The author's philosophy with regard to using both surgical and radiologic treatment when indicated serves to emphasize that teamwork rather than competition between surgeons, radiologists, and pathologists is necessary if the greatest number of patients is to receive the best therapy. The author does not go into the details of operative technique but radiation therapy is discussed at length reflecting perhaps the preponderance of the author's own experience. The book's greatest value will be to the general practitioner and radiologist. The surgeon and pathologist engaged in tumor clinic work will also find the book useful.

—Lt Col R. S. Ironson, MC U S A.

**An Index of Tumor Chemotherapy** a tabulated compilation of data from the literature on clinical and experimental investigations by Helen M. Dyer *Biochemist National Cancer Institute National Institutes of Health*. Distribution to persons engaged in cancer research or some allied field, free of charge, by Federal Security Agency.

This large, paper-bound book has been prepared to furnish investigators in cancer research with a comprehensive survey of the literature on the treatment of tumors by chemical method. In evaluating this index, the reader must remember that the Council on Pharmacy and Chemistry of the American Medical Association considers that the presently established treatment for cancer consists of the judicious use of surgical operations and/or irradiation. For years investigators have been trying to find a chemical substance which would destroy the cells of the invading tumor and spare the normal cells. Ehrlich was one of the pioneers in this field. Since his time hundreds of investigators have used different chemicals in this type of investigation. The reports of these studies are many and varied and scattered throughout the world's medical literature. Those investigating cancer will probably find this index valuable as they may look up the results of the use of various types of chemical in the treatment of malignancy and, if interested, read of the work in the original articles which are listed. This compilation of data represents a tremendous amount of work. The average practicing physician and surgeon would not have much use for it but should know of its existence.—Col. Dean M. Walker MC U S A.

**Therapeutic Radiology** by George Winslow Holmes, M.D. *Radiologist Waldo County General Hospital Maine Honorary Physician Massachusetts General Hospital Radiologist in Chief Massachusetts General Hospital 1916-1931 Clinical Professor of Roentgenology Emeritus Harvard Medical School* and Milfred D. Schultz, M.D. *Radiologist Massachusetts General Hospital Instructor in Radiology Harvard Medical School*. 31 pages with 121 illustrations, 10 in color. Lea & Febiger Philadelphia, Pa., publishers, 1930. Price \$7.50.

The authors state in the preface that their object is "to present in a concise manner the development, principles and use of radiation, especially with the roentgen ray in the treatment of disease." This they have done in their excellent introduction to roentgen radiation therapy. Mention of radium is only for cancer of the cervix and radiology is almost entirely limited to references. This is not a drawback, as it keeps the book to a reasonable size and after all the fundamental radiation effect is essentially the same. Also to avoid controversial discussion. It has occasionally been necessary to be rather brief and somewhat dogmatic which is acceptable from a teaching point of view.

The table of content is comprehensive. About one-third of the book is devoted to history, fundamental concept of physics, biologic effects, characteristics of various sources of radiation, and tumor responses followed by a few pages on the preparation and care of patients. The major portion of the book is rationally presented. A most useful feature of this section for instructional purposes is the incorporation of typical case histories, which present the problem, how it was met, specific factors used for therapy, reactions obtained, and the follow-up. It is from these specific case studies that the illustrative material is selected. The illustrations are of good quality and the diagrams are practical. The last two chapters cover radiation protection, with perhaps a little too much data on radium, and drive on medico-legal problems of therapeutic radiology.

—C. M. Z. B. Over, A. M. C. A. U. R. (Inact.)

**Pathologic Physiology: Mechanisms of Disease** edited by William A. Solomon, M. D. F. A. C. P. *Dr. William Henderson Professor of the Prevention of Tropical and Semi-Tropical Diseases, Tulane University of Louisiana School of Medicine, Senior Visiting Physician, Charity Hospital of Louisiana General Medicine, U. S. Marine Hospital at New Orleans, 805* pages. Illustrated. W. B. Saunders Co., Philadelphia, Pa. publishers, 1950. Price \$11.50.

This volume is a collaborative effort by 25 authors who are expert in their respective field. The subject matter encompasses the circulatory, respiratory and digestive system, the blood and spleen, the urinary tract, the endocrine glands, water balance, nutrition, the locomotor system, infectious diseases, allergy and physical, toxic and chemical agents. Each of these subjects is discussed in the light of the most modern concept of disturbed physiology. This text encompasses all the field of medicine with special emphasis on the problems of internal medicine. Nowhere is there a better compilation of this material than this volume. It is of the utmost value for the student, the practicing physician, and the teacher of medicine.

—Chas. H. H. L. L. L. L. M. C. I. B. V.

**Endodontia, The Clinical Pathology and Treatment of the Root Canal and Pulpless Teeth.** by Edgar D. Collidge, D. S. M. R. D. D. S. LL. D. (Hon. Legals) Emeritus Professor of Therapeutics, Preventive Dentistry and Oral Hygiene, Chicago College of Dental Surgery, School of Dentistry, Loyd University, Chicago, Ill. formerly Professor of Medical and Dental Pathology and Therapeutics of the School of Dentistry University of Illinois. 367 pages. 377 illustrations on 170 figures and colored plates. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price \$6.

The author's knowledge and practical application of therapeutic principles is made evident early in the text when he discusses such topics as the pharmacologic action of drug, immunity to disease and etiologic and symptomatic treatment of disease. In greater detail the author discusses the action of zinc in pulp devitalization and of paraformaldehyde in pulp mummification. He gives a good description of the pharmacologic action and therapeutic values of chloramine solutions, disinfecting root canal and of Loxal solution as root canal dressing to stimulate repair of disturbed periapical tissues. Of great value is his discussion of the use of sulfonamides and other antibiotics in the treatment of infected canal. He stresses the importance of being familiar with the pharmacologic action of the various drugs and remedies used in preparing the patient for operation and in the control of pulpal diseases. The technique for treating, preparing and filling of root canal of pulpless teeth is well covered.

with many fine illustrations to supplement the text. The indication and technique for root resection are thoroughly explained.

The most valuable sections of the book are those in which the author demonstrates the futility of the concept that once the pulp of a tooth has been removed or destroyed, that tooth can no longer be retained as a living and functioning member of the dental arch. By means of numerous roentgenograms and histologic sections the author shows how healing takes place in and about the periapical rarefactions once the source of irritation in the canals is properly eliminated, i. e., by complete disinfection and obliteration of the canal. The author stresses the idea that the root filling must completely obliterate the root canal in length and diameter in order to avoid accumulation and stagnation of lymph and tissue exudate which interferes with or completely checks the process of repair.

A detailed description of various pulpal and periapical disturbances from pulpal hyperemia to pulp necrosis and gangrene through granulomas and cysts with their various clinical manifestations by both subjective and objective signs and symptoms plus complete correlative radiographic and histologic illustrations of the pulpal lesions found in each condition is an invaluable aid in making a diagnosis of the state of the pulp on first presentation. It also gives to the operator a clear picture of the condition he has to contend with. It serves as a guide in the treatment to be used.

In this work the rationale behind present day methods of retaining pulpless teeth is so clearly and forcefully presented that no one in the practice of the healing arts can have any qualms or reservations as to the fundamental scientific correctness of this practice. This book should prove extremely valuable as a text for students and as a handy reference work to the dentist in active practice.—*Capt. M. Dicker U. S. A. I. (DC)*

**The Meaning and Practice of Psychotherapy** by V. E. Fisher Ph. D. *Psychologist and Psychotherapist Formerly Assistant Psychologist Worcester State Hospital Assistant Professor of Psychology and Director of the Mental Clinic New York University Washington Square College Psychologist and Psychotherapist Idaho State Hospital South.* 411 pages. The Macmillan Co., New York N. Y. publishers 10-0. Price \$5.

The expressed purpose of the author of this book is to describe and illustrate such procedures and techniques as he has found to be most effective. It is addressed to advanced students of psychology in the abnormal, clinical, therapeutic and counseling fields to psychotherapists, psychiatrists, psychological counselors, and social workers. The author gives a definition of psychotherapy and lists various psychotherapeutic techniques. The book is divided into four parts. Part 1 "A General Orientation" includes a suggested method of history taking, a description of the use and value of psychological testing, and suggests and describes the author's method of management of the patient. Part 2 "Some Psychotic and Closely Related Disorders" includes early schizophrenic and other psychotic disorders considered by the author to be amenable to psychotherapy, psychopathic and hypochondriacal reactions. In Part 3, "Psychoneurotic Reactions," the author discusses anxiety equivalent reaction, anxiety hysteria, phobias and mental regression. He justifies the use of the term anxiety equivalent by stating it is more correct than the popular term psychosomatic. Part 4, "Some Maladjusted Lay Social Tendencies and Reactions," includes a brief evaluation of suicidal tendencies, compulsive drinking, feelings of inferiority, homosexual tendencies, psychosomatic sexual frigidity and marital discord. The author uses case histories to illustrate his points.—*Commander H. S. Colony MC U. S. N.*



**Cytology of the Human Vagina**, by Inda L. C. De Allende M. D., *Chief of the Division of Endocrinology Merced* and *Marti Ferreyra Institut of Medical Investigation*, and Oscar Orías, M. D. *Director Mercedes and Marti Ferreyra Institut of Medical Investigation, Córdoba Argentina* with a foreword by Bernardo A. Houssay M. D. translated from the Spanish by George W. Corner M. D. 286 pages. Paul B. Hoeber Inc. New York, N. Y., publisher 1950. Price \$7.00.

In this book the authors attempt to correlate some of the cytologic findings in vaginal secretions with the various phases of the menstrual cycle normal and abnormal, with clinical endocrinopathies and to provide a basis for estimating the optimal hormone treatment. The approach is not new but is a continuation of Sborr's work. A great deal of original work has gone into the preparation of the book. It opens new vistas for research in functionally normal and abnormal conditions particularly as they may be manifested in the epithelium of the vagina and cervix. The authors have made beginning in accumulating data which may lead to a clinical method of evaluating the need for supplementary hormones, selecting the one or ones required, and interpreting the results obtained. The translator is to be commended for his lucidity. The book is exceptionally well illustrated. Graphs and tables are effectively used.

—Commander Roy E. Crowder MC (S. S.)

**The 1950 Year Book of Medicine** (May 1949–May 1950) Edited by Paul B. Beeson, M. D., J. Burns Amberson, M. D. William B. Castle M. D. B. M. (Hon.) Yale, M. D. (Hon.) Utrecht, Timothy R. Harrison, M. D. and George B. Eysterman, M. D. 819 pages. Illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$5.

This book reviews current medical literature from May 1949 to May 1950, under the following headings: Infections, The Chest, Blood and Blood Forming Organs, Heart, Blood Vessels and Lymphatics and The Digestive System. In addition to the usual succinct editorial comment each editor has prepared an introductory chapter reviewing the significant medical advances during the decade 1940–50. This is exciting reading and readily impresses one that medicine today is far from static. The range of the subject matter and the extensiveness of the literature covered in this book is such that no practitioner has the time or background to review and appreciate the important contributions in all branches of internal medicine. The several editors together have attempted to cover the field and therefore this is required reading for the astute internist or general clinician. The only criticism offered is that consideration of BCG vaccine attention was directed toward its drawbacks and our ignorance concerning its mode of action without mention of the increasing evidence that vaccinated persons have significantly decreased mortality and morbidity from tuberculosis and that vaccination is a relatively innocuous procedure.

—Lt Col W. J. W. Hart MC USA

**Medical Parasitology for Medical Students and Practicing Physicians** by William G. Sawitz, M. D., *Associate Professor of Parasitology Assistant in Medicine The Jefferson Medical College of Philadelphia Special Consultant U. S. Public Health Service Communicable Disease Center Atlanta Ga.* 296 pages. Illustrated. The Blakiston Co., Philadelphia, Pa., publishers, 1950. Price \$4.25.

The author states "This manual is intended as a lecture and laboratory guide for student in their course in medical parasitology. It does not and is not intended to, replace textbooks which are essential for parasitologists. Medi-

cal schools, however do not train parasitologists." To achieve this end much of the material is presented in abbreviated or outline form or in telegraphic style. The book is of real value in that the tables and charts include much recent information not generally available in texts, including data on drugs, insect repellents, and insecticides. Dosages are tersely specified in each case. As a rule the charts and tables are excellent but many of the illustrations are poor one or two of the figures being unrecognizable. The keys are of too limited a scope to be of much use in the identification of parasites but are of value in enabling students to learn some of the criteria used in classification and identification. The clinical descriptions are at times sketchy. The toxicity of certain anthelmintics are not adequately stressed. This book will be useful if supplemented by the use of standard texts, laboratory guides and adequate lecture material. It has real merit as a review of the subject of parasitology particularly insofar as it enables one quickly to find notes on the most recent advances in the therapy of parasitologic infections and in the control of arthropods of medical importance.—*Max R. Traub M.D. U.S.A.*

*Hematology for Students and Practitioners*, by Willis M. Fowler M.D. *Professor of Internal Medicine University of Iowa Iowa City Ia.* with a chapter by Elmer L. DeGruen, M.D. *Associate Professor of Internal Medicine University of Iowa Iowa City Ia.* 2d edition, revised. 535 pages, illustrated. Paul R. Hoebe Inc. New York, N.Y. publishers, 1940. Price \$8.75.

This second edition of a valuable textbook on hematology presents the usual aspects of hematologic disorders, physiology of hemopoiesis and blood dyscrasias, in a thoroughly accurate simple and satisfactory manner. The sections on hematologic methods, the transfusion of whole blood and blood derivatives, and leukemia are particularly good. The author states in his preface "that hematology is a part of internal medicine rather than a specialty in itself, and the subject has been presented in this light, stressing the clinical and the therapeutic aspects of the various diseases." This is not a textbook for research hematologists. The concept of hyperheparinemia and the effect of radiation on the hemopoietic tissues are completely omitted although the latter is of considerable importance in current times when atomic warfare is conceivable. The illustrations are in general excellent the bibliography is limited but adequate. The book is highly recommended for the medical student and for the practitioner of medicine.—*Commander E. P. Cronkite M.C. U.S.N.*

*Selected Studies on Arteriosclerosis*, by Rudolf Altshuler M.D. *Dr. Professor of Histology University of Saskatchewan Saskatoon Can.* 152 pages, illustrated. Charles C. Thomas Publisher Springfield Ill. 1940. Price \$3.00.

In discussing the morphologic changes in experimental arteriosclerosis and in the correlation of his own investigations with others engaged in parallel work, the author offers an engaging series of adducement that one will not peruse through the obviousness of his writing. To the reviewer the almost exclusively morphologic approach to the problem seems anachronistic. With increasing vision opening continually in hormonal and enzymatic concepts of the origin of disease the days of the morphologist appear to be numbered. This work is best categorized by the sentence taken from the preface. It makes a claim of belonging to the clinician or even to the hospital pathologist.

—*LEO A. MORAN M.C. U.S.N.*

**Endodontia**, by Bernhard Gottlieb, M. D. (University of Vienna) D. M. D. Hon. (University of Bonn) LL. D. Hon. (Loyola University Chicago) Professor of Oral Pathology and Dental Research Baylor University College of Dentistry Dallas, Tex. Honorary Member of the American Association of Endodontists formerly Professor and Head of Department of Histologic Research College of Dentistry University of Vienna. Beth Lee Barron, D.D.S., Assistant Professor of Root Canal Therapy Baylor University College of Dentistry Dallas, Tex. and J. Hobson Crook, D. D. S., Associate in Dentistry Baylor University College of Dentistry Dallas, Tex. 177 pages. Illustrated. The C. V. Mosby Co. St. Louis, Mo. publishers, 1950. Price \$4.

This book is mainly a report of the histologic findings resulting from experimental root canal treatment in dogs. Numerous short articles on subjects related to endodontia are included. The book is not composed of chapters, but is divided only by topical headings. It is well illustrated, and 63 of the figures are exceptionally good photomicrographs. The authors believe that their most important contribution is the histologic demonstration that cementum will bridge over the outlet of pulp canal when dentine powder is used in root canal therapy. Some of the theories presented in certain sections are contrary to generally accepted competent opinion, but on the whole the book is stimulating addition to dental literature. Because this is not a complete textbook on endodontia, but rather an informal discussion of certain phases of the subject, it is recommended only as supplemental reading for those having particular interest in this field.—*Commander R. L. Coffey DC U S N*

**The Esophagus and Pharynx in Action, A Study of Structure in Relation to Function**, by William Lerche, M. D. Fellow American College of Surgeons. Founder Member and Honorary Member of the American Association for Thoracic Surgery University of Minnesota, Minneapolis, Minn. 222 pages. Illustrated. Charles C Thomas, Publisher Springfield, Ill. 1950. Price \$5.00.

The primary purpose of the author is discussion of the closing mechanism of the cardia of the stomach. The book also includes description of the physiologic activity and function of the esophagus in the process of swallowing and regurgitation. This is an excellent monograph on the function of the esophagus and is of interest to those concerned with gastroenterology and surgery of the esophagus.—*Commander T. O. Ryan, MC U S N*

**Principles of Public Health Administration**, by John J. Hanlon, M. B. M. D. M. P. H., a socialist Professor of Public Health Practice School of Public Health University of Michigan and Chief Medical Officer and Assistant Chief of Party Bolshakoff Institute for Inter-American Affairs. 400 pages. Illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers. 1951. Price \$1.

No one would expect to read through this comprehensive book in 1 evening or 20 evenings. The principles are those taught by the nation's leading school of public health and may be safely quoted as references. Each chapter contains a large section of civilian health department work and is particularly complete in the background of laws and customs which have accompanied our social advances in the United States. The use of graphs and charts with explanations of the strengths and weaknesses of each helps in understanding the complexities of modern state and city government within our country. Two chapters are worthy of special comment. The chapter entitled Personnel Factors is

"Public Health" contain many practical suggestions which would improve the human relationships of health departments and also in other local governmental departments and the one entitled "Public Relations in the Public Health Program" points the way for selling better service and reaching more persons and explains why some worthy programs have failed in the past. The material in part 8 presents both sides of the perplexing relationships in oiling public health and private enterprises. In this controversy the more understanding health officials read both sides, the more surely a workable solution can be found. The fair and impartial discussions will be of much help to administrators in health departments and to those working toward this goal.

—*Chas. G. Orth, MC U S A.*

**The Principles and Practices of Rehabilitation**, by Henry H. Kessler M. D. Ph. D. in collaboration with other authors. 448 pages with 182 illustrations and a colored plate. Lea & Febiger Philadelphia, Pa., publishers, 1950. Price \$9.

Treatment of the patient as a whole rather than of a disease or injury is the central theme of this book. Dr. Kessler has chosen his 20 collaborators well. Together they have put out a well-written volume, general in scope and content which should serve as a useful guide. Orthopedic and plastic surgeons and workers in the various fields of physical therapy, prosthetics and social welfare will find this volume useful in providing a background and an insight into the problems of their coworkers. The text is not limited to the rehabilitation of a single type of patient but through the use of a number of contributors, each a specialist in his own field, runs the gamut from the chronically ill to the deformed. The text is divided into two parts entitled (1) Principles and (2) Practice. The scope of the book is so broad that there is little or no room for detailed instructions. It achieves its aim and presents an integrated picture of the armamentarium available to those medical and lay persons who deal extensively with the physically and mentally handicapped.

—*Lt. Comdr. C. F. Orofino, MC U S. N.*

**Recent Advances in Ocular Prosthesis**, by J. H. Prince F. B. O. A., F. R. M. C., F. R. M. S., F. Z. B. A companion volume to "Ocular Prosthesis" 157 pages illustrated. The Williams & Wilkins Co., Baltimore, Md. publishers 1950. Price \$4.

This small text brings one up to date on plastic artificial eyes, augmenting the author's previous book "Ocular Prosthesis." Six of the ten chapters deal with different methods of making conjunctival impressions, properties of materials used, preparation of artificial irides and the fabrication and processing of acrylic eyes. A smaller but adequate portion of the text deals with the newer meshed and peg implants outlining the different operative procedures and the advantages of the various types. The procedures are well illustrated. An outline of treatment for some unusual cases of contracted fornices and sockets is presented. A few pages are devoted to plastic surgery and the consideration of permanently embedded prostheses. Detachable facial and orbital prostheses are discussed in general terms. The book is well written and adequately indexed. Although it is not the practice in this country for ophthalmologists to concern themselves directly with the making of artificial eyes, nevertheless they could find in this small text much about the subject that they should know and also information that would enable them to express an intelligent opinion about the finished fitted prosthesis.

—*Commander P. J. Glotta MC U S. N.*

**Surgery of the Eye: Injuries by Alvin Callahan, H. A., M. R. (Ophthalm.) M. D. F. A. C. S., Professor of Ophthalmology, Medical College of Alabama, and Director Thayer-Cater Eye Hospital Birmingham, Ala. formerly Chief Eye Surgeon North Station General Hospital, New Haven, Conn. 415 pages. 37 illustrations. Charles C Thomas, Publisher, Springfield, Ill., 1944. Price \$11.**

This text is of special importance to the military ophthalmologist. The author served in Army ophthalmic center during World War II where he was able to study 3,000 men with injuries of the eye and adnexa. More than that time he has had further opportunity to study eye injuries and surgical procedures at the Thayer-Cater Eye Hospital, Birmingham, Ala. The surgical procedures described are those which gave the best results in his hands. The operative sketches and eye photographs are excellent. The final aim of this book is fortunate now that our military hospitals are receiving many eye casualties from Korea. This text is highly recommended to all military ophthalmologists. They will profit from the clinical techniques described in this book and pass these benefits on to their patients.—R. Lewis C. A. Swenson, MC, U. S. N.

**Essentials of Ophthalmology by Roland L. Pritchard, M. D. F. A. C. S. F. I. C. S. Eye Surgeon, Hartford Hospital, New Haven, Conn. by and Associated American Hospital Consulting Ophthalmologist at Anthony Hospital, Hartford, Ill. 571 pages. 210 illustrations including 18 subjects in color. The J. B. Lippincott Co., Philadelphia, Pa. publishers 1944. Price \$14.00.**

The author has maintained rigid faithfulness to his title. This fidelity has resulted in what is almost an encyclopedia of ophthalmic terms. This book provides the question, "Who, precisely, are the beneficiaries of such condensed material?" The answer is stated for teachers, undergraduate medical students, and the more serious student of ophthalmology demands more than was acquired briefly. The general practitioners with whom I have discussed this problem are not interested in even brief treatment of such matters as cataracts, astigmatism, and spectacle fitting. They are interested in ocular first aid, differential diagnosis of acute ophthalmic pathology, and the signs manifest themselves of organic and neurologic disease. These subjects could have been treated more fully in this volume. The method of job final optics uses three dimensional drawings to refreshing advantage. The illustrations throughout are excellent.

—Lawrence J. A. Hoyer, MC, U. S. N.

**Practical Gynecology by Walter J. Reich, M. D. F. A. C. S. F. I. C. S. Attending Gynecologist and Chief of Gynecology at Hospital, Professor of Gynecology, Cornell University Medical School, New York City. 415 pages. 115 illustrations. The J. B. Lippincott Co., Philadelphia, Pa. publishers 1944. Price \$14.00.**

The general practitioner, house resident, and intern frequently inquire concerning the proper approach to the management and treatment of various type procedures in gynecology. This book and exercise volume in practical gynecology would

implement and extend the sketchy and hurried instruction noted in some medical school curricula and hospital teaching programs. The excellence and clarity of composition of the many fine drawings, colored plates, and other reproduced materials enhance the well written easily read text. This book is based on a popular series of conferences and demonstrations given by the authors in their postgraduate course in gynecology at Cook County Hospital, Chicago, Ill. It offers a simple guide to the technic of office-type practice founded on years of gynecologic outpatient clinical work. Controversial and esoteric material which so often confuse the novice and general practitioner have been omitted for the most part making for greater clarity easier reading and assimilation. It should serve as a firm foundation and incentive to the study of more detailed and comprehensive textbooks on the subject.

In addition to elaborating the technic of office gynecology including systematic routine and thorough examination, laboratory tests, biopsies, cytology, diagnosis, and management of common disorders, great stress is placed on the fact that treatment and instrument recommended are those commonly available or easily improvised in the physician's office or clinic thus often obviating costly equipment and hospitalization. Of special value are the chapters on the practical approach to gynecologic diagnosis, the early detection of cancer, common gynecologic complaints, premarital examination and consultations. The absence of a bibliography detracts from the value of the book but the index is especially complete.—*Col E L Zimmerman MJC USA*

**Medical Physics, Volume II.** Edited in Chief Otto Glasner Ph. D. F. A. C. R., *Diplomate in Radiological Physics American Board of Radiology Professor of Biophysics, Frank E. Bunts Educational Institute Head Department of Biophysics Cleveland Clinic Foundation Consultant U S Veterans' Administration Washington D C* and editorial assistant Jessie C. Tucker *Cleveland Ohio* and associate editors 1,227 pages 675 illustrations. The Year Book Publishers Inc. Chicago, Ill., publishers, 10.00 Price \$2.

Volume II contains almost 1,200 pages of encyclopedic information on application of modern physical science to medical and biological phenomena. Many of the 181 contributors are recognized authorities in the specialties on which they write. The book is expensive but well printed and highly recommended for ready reference to the numerous and intricate specialties of modern medical biophysics. Extensive references are appended to each chapter for those inclined toward serious investigation. Prospective purchasers should note however that Volume II complements and supplements the first volume. Chapters and subjects treated in Volume I appear in Volume II only by title but where rapid and important advances have been made since 1944 the new material only appears in Volume II with reference to the introductory chapter of Volume I. The books will be of greatest value when purchased and used together.

Particular emphasis has been placed on atomic radiation phenomena and especially on the biological and medical applications. Several chapters of introductory information on particle accelerators, radiation counts, isotopes and so forth, have been included. Roentgenology, radiations, optics, and photography have been extensively treated. The variety of other subjects such that many difficult editorial problems were undoubtedly encountered in the attainment of space and many readers may feel that their own special interests have been too lightly dismissed. Cold and surface phenomena for instance were allotted 2 pages of historical generality whereas 6 pages and about 20 illustrations were devoted to types of hypodermic needles and how to sharpen them. Impartial reflection, however should lead the reader to the conclusion that each individual

prejudices must necessarily be discarded. A book of this scope and that, in the final analysis the editors and authors have produced comprehensive and masterful introduction to a very large number of specialties in biochemistry.

—Lt Col. M. E. Freeman M&C U. S. A.

**The Management of Obstetric Difficulties**, by Paul Titus, M. D. *Obstetrics & Gynecology* 1 to 16 St. Margaret Memorial Hospital Pillsbury Consultants *Obstetrics and Gynecology* 1 to 16 St. David Hospital Pillsbury Secretory of the American Board of Obstetrics & Gynecology Member Secretory of the American Board of Obstetrics & Gynecology. 1946 pages with 446 illustrations and 9 color plates. The C. V. Mosby Co. St. Louis, Mo. published, 1950. Price \$14.

This work has always been unique in that it states its purpose in the title and then proceeds to show the how, why and when with the least unnecessary verbiage. The problems currently debated in the recent literature are adequately treated and the author's position stated. The entire subject is completely covered and yet there is no effort to make the volume encyclopedic. This edition has 40 more pages than the third edition, the result of sandwiching new paragraphs into the old text. It is hoped that the author can see fit completely to rewrite the next edition of it is likely to become so voluminous to defeat its purpose. This is one of the few books addressed to physicians in active practice rather than to medical students. As such, it is an indispensable addition to the personal library of a young concerned with the welfare of the pregnant and parturient woman. Based as it is on the clinical work of the author and his associates, it has personal flavor too often missing in modern texts and reference books.

—Commodore R. E. Crowder MC USN

**Principles of Orthodontics**, by J. A. Salzmann, D. D. S. F. A. P. H. A., *Associate Chief of Dentistry & Head of Orthodontics at the Mt. Sinai Hospital, New York* formerly Chief of the Dental Service at the New York City Vocation Schools *Associate Editor of the American Journal of Orthodontics* *Editor of the New York Journal of Dentistry* 2nd edition. 887 pages 733 illustrations. J. B. Lippincott Co. Philadelphia Pa. publishers, 1950. Price \$14.

This book represents a landmark in the progress of dental literature. The use of vast amount of source material combined with personal perceptions gained at the chair has led to a balanced text. There are numerous illustrations.

The basis of orthodontic science is not merely a matter of making or designing a mechanical appliance which will push or pull teeth or groups of teeth into certain positions but rather a system for understanding and removing causes which lead to the various oral and facial deformities. Other means than mechanotherapy should be tried reserving the use of mechanical appliances as last resort. For these reasons the author treated the major portions of child development and growth of the head, developmental anatomy and physiology of the face and the jaws, development of the dentition, the endocrine gland in relation to dentofacial deformity, treatment of incipient malocclusion, and preventive orthodontics and public health. Only in small sections towards the end of the work does the author flow into view with him some of the more popular form of appliances in mechanotherapy but even here there is great interest in detail. A clear picture of the practical application of the labial and lingual appliances, the Angle edgewise appliance, the Tweed method, the Jaws-to-teeth wire appliance, and the Norwegian system for treatment of malocclusions is given.

The author warns those who practice orthodontics to beware of too rapid tooth movement because of the attendant destruction of tooth vitality and osseous structures. The book is of value to those who do not practice orthodontics because it helps to evaluate and understand the significance of causative factors in malocclusion and because it stresses early detection and timely interception of incipient developmental anomalies and thereby enables us to direct the patient to the physician or dentist for proper therapy. To the orthodontist in active practice this book should serve as a guide for diagnosing and treating the pathologic states that present themselves to him. The general use of this text in dental colleges is to be recommended but an expert teacher of orthodontics must elaborate on the text to clarify certain parts which may prove too complex for the dental student. For the graduate dentist studying the specialty of orthodontics this book will be indispensable. A large list of references is included.

—Capt M. Dicker U. S. A. F. (DC)

**An Atlas of Human Anatomy** by Harry J. Anson, Ph. D. *Professor of Anatomy, Northwestern University Medical School*. 518 pages. Illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1930. Price \$11.50.

This valuable new anatomical atlas should prove most welcome to medical student and clinicians alike. The preparation of an anatomy text is always a Herculean undertaking and Dr. Anson and his colleagues have expended much time and effort compiling and editing this work which represents the fruition of a long term project.

The atlas should serve equally well as a dissecting manual or as a surgical anatomy reference book.

The illustrations for the most part are refreshingly new and original. Those few drawings which are modifications of plates taken from other standard works are clearly identified as such. A minimum of diagrammatic illustrations are used. The labeling of the various structures in the plates is in large, easily read, hand lettering. There is none of the crowding present which is so often encountered in some of the older texts. The explanations given at the bottom of the pages containing illustrations are clear and concise. There are relatively few color plates—probably because of the expense involved in reproducing them. Their lack, however, does not detract from the general value of the book.

A splendid series of drawings of the internal and middle ear structures are outstanding features of the atlas. The inclusion of the many illustrations showing anatomic variations is a valuable innovation. Variation in the types of origin of the branches and tributaries of important arteries, veins and nerves are well illustrated. Variations in the form and structure of the thoracic duct, vermiform appendix, stomach, pelvic colon, and hepatic pedicle are also clearly portrayed. The drawings dealing with hernia of various types are especially well done and helpful from a definite value to surgeons. Dr. Anson has included many figures taken from his articles published in various scientific journals.

—Col L. L. Hancock M. C. U. S. A.